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CHARLES ELMORE CROPLEY
CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1929.

No. [redacted]riginal [redacted] 12 5 9

STATE OF NEW JERSEY,

Plaintiff,

vs.

STATE OF NEW YORK, AND THE CITY OF NEW YORK,

Defendants,

Motion for Leave to File Reply to the Amended Answer of the Defendant, The City of New York, and Reply.

WILLIAM A. STEVENS,
Attorney-General.

DUANE E. MINARD,
Assistant Attorney-General,
Solicitors for Plaintiff.
State House, Trenton, N. J.

Arthur W. Cross, Law Printer, 55-57 Lafayette Street, Newark, N. J.

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IN THE SUPREME COURT OF THE UNITED STATES.

October Term, 1929.

No. 17, Original.

STATE OF NEW JERSEY,

Plaintiff,

vs.

STATE OF NEW YORK, AND THE CITY OF NEW YORK,

Defendants,

NOTICE.

TO:

Hon. Arthur J. Hilly, Corporation Counsel,
Solicitor for Defendant, The City of New York.

SIR:

Please be advised that on Monday, January 27, 1930, the plaintiff will apply to the Court for leave to file the annexed reply to the amended answer of the defendant, City of New York.

WILLIAM A. STEVENS,
Attorney-General.

DUANE E. MINARD,
Assistant Attorney-General,
Solicitors for Plaintiff.

Dated January 8, 1930.

Notice.

Service hereof is acknowledged this 22nd day of January, 1930.

ARTHUR J. HILLY,
Corporation Counsel,
Solicitor for Defendant,
The City of New York.

IN THE SUPREME COURT OF THE UNITED STATES.

October Term, 1929.

No. 17, Original.

STATE OF NEW JERSEY,

Plaintiff,

vs.

STATE OF NEW YORK, AND THE CITY OF NEW YORK,

Defendants.

IN EQUITY.

MOTION FOR LEAVE TO FILE A REPLY TO THE AMENDED ANSWER OF THE DEFENDANT, CITY OF NEW YORK.

Comes now the State of New Jersey, by its Attorney-General, and asks leave of the Court to file its reply, herewith submitted, to the amended answer of the defendant, City of New York.

WILLIAM A. STEVENS,
Attorney-General.

DUANE E. MINARD,
Assistant Attorney-General,
Solicitors for Plaintiff.

January 27, 1930.

Reply.

IN THE SUPREME COURT OF THE UNITED STATES.

October Term, 1929.

No. 17, Original.

STATE OF NEW JERSEY,

Plaintiff,

vs.

STATE OF NEW YORK, AND THE CITY OF NEW YORK,

Defendants,

IN EQUITY.

REPLY.

The plaintiff joins issue on the amended answer of the defendant, City of New York.

WILLIAM A. STEVENS,
Attorney-General.

DUANE E. MINARD,
Assistant Attorney-General,
Solicitors for Plaintiff.

FEB 8 1930
CHARLES ELMORE CROPLEY
CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1928. ORIGINAL No. 121

STATE OF NEW JERSEY, Plaintiff,

v.

STATE OF NEW YORK and THE CITY OF NEW YORK,
Defendants.

STATEMENT OF INTEREST AND RELIEF DESIRED BY THE COMMONWEALTH OF PENNSYLVANIA, INTERVENOR.

COMMONWEALTH OF PENNSYLVANIA,
Intervenor.

By CYRUS E. WOODS,
Attorney General.

OWEN J. ROBERTS,
Special Assistant to the Attorney General,
Solicitors for Intervenor.

ALLEN, LANE & SCOTT, PRS., PHILADELPHIA.

IN THE

Supreme Court of the United States

OCTOBER TERM, 1928. ORIGINAL NO. 17.

State of New Jersey, Plaintiff,

v.

State of New York and The City of New York, Defendants.

STATEMENT OF INTEREST AND RELIEF DESIRED BY THE COMMONWEALTH OF PENNSYLVANIA, INTERVENOR.

TO THE HONORABLE, THE CHIEF JUSTICE AND THE ASSOCIATE JUSTICES OF THE SUPREME COURT OF THE UNITED STATES:

Pursuant to the order of this Court dated January 6, 1930, sur the petition for leave to intervene, the Commonwealth of Pennsylvania, as Intervenor, respectfully submits the following

Statement of Interest.

1. The interest of the Commonwealth of Pennsylvania in the water resources of the Delaware River and its tributaries lies in the development thereof through regulated control of storage and release of waters from impounding dams, which will tend toward reduction of flood flows and increase of low water flows, and bring about the maximum utilization of said water resources for domestic and municipal water supply and sanitation, industrial water supply and the development of water power.

2. A number of municipalities of the Commonwealth of Pennsylvania at the present time obtain their water supply from the Delaware River and its tributaries, which will be the necessary source of increased supply to these municipalities, and also will become the source of supply of other municipalities lying within the basin of the Delaware River and its tributaries. The City of Philadelphia at the present time obtains its water supply from the tidal waters of the Delaware River and from the Schuylkill River, a tributary of the Delaware. The said city, from time to time, has caused studies to be made, by its engineering forces and by consulting engineers employed for the purpose, of possible sources for its future water supply, and among other plans for development, the use of the Delaware River above the head of tide at Trenton has been advocated and the future need for

water from the upper Delaware or from tributaries of the upper Delaware has been recognized. Application of the principles set forth in New Jersey's bill of complaint would prevent the future development and use of the Delaware River or its tributaries above the head of tide water as a source of water supply to the City of Philadelphia and/or other municipalities, cities, towns, villages and communities contiguous to the Delaware River and its tributaries.

3. It is disclosed by the pleadings in this cause that the City of New York now has in contemplation a definite project of impounding waters from certain tributaries of the Delaware River in the State of New York and for the diversion of a portion of said waters to the City of New York. The Commonwealth of Pennsylvania desires to be admitted to cross examine witnesses and if necessary to present evidence on the question whether such impounding and diversion will work material damage to the Commonwealth of Pennsylvania, its municipalities and inhabitants, and also to present evidence disclosing the present and reasonable future needs to the waters of the Delaware River and its tributaries by the Commonwealth of Pennsylvania, its municipalities and inhabitants. The Commonwealth of Pennsylvania desires to be heard upon the following questions:

(*a*) Whether the proposed impounding and diversion is in accordance with a fair and equitable division

between the States of New Jersey and New York and the Commonwealth of Pennsylvania of the waters of the Delaware and its tributaries.

(*b*) Whether the proposed impounding and diversion will cause material damage to the Commonwealth of Pennsylvania, its municipalities and inhabitants.

(*c*) Whether any allocation which may be made by this Court, pursuant to this proceeding, of the waters of the Delaware River to the State of New York, shall not be limited and circumscribed by the doctrine that no such allocation shall deprive the Commonwealth of Pennsylvania of its fair and equitable share of the waters of the Delaware River and its tributaries to meet its reasonable future needs; the question as the Commonwealth of Pennsylvania conceives it being not one of prior appropriation, but of a just and equitable allocation, having in mind not only the present but the reasonable future needs of all the States interested in the waters of the Delaware River and its tributaries.

4. The City of New York proposes to divert water from certain tributaries of the Delaware River in New York State under certain terms, conditions, and limitations, all of which are set forth in New York's answer to the Bill of Complaint filed by New Jersey in this Court. It is of the utmost importance to the Commonwealth of Pennsylvania that its rights in the waters of the Delaware River shall not be infringed by any adjudication in the pending controversy and

that the total quantity of the waters to be diverted by New York under such adjudication shall be determined as included as an integral part of New York's share in the waters of the Delaware River in any present or subsequent or final allocation of such waters between the States of New York and New Jersey and the Commonwealth of Pennsylvania; and the Commonwealth of Pennsylvania desires to be heard also in this matter. Any allocation of the waters or any conditions which will govern diversions will vitally affect the future growth and prosperity of the Commonwealth of Pennsylvania and in particular that portion thereof situated within the basin of the Delaware River.

5. It is disclosed by the pleadings in this cause that the project of the City of New York contemplates the release of impounded flood waters for the purpose of increasing the low water flow of the Delaware River. The Commonwealth of Pennsylvania desires to examine the witnesses called by the parties to the proceeding and if necessary to offer evidence on its own behalf on the question of the adequacy of the plans for the release of flood waters for maintenance of the flow of the Delaware River in periods of low flow.

Relief Desired.

Pursuant to said order of January 6, 1930, the Commonwealth of Pennsylvania submits the following statement as to the relief, if any, desired by it.

The Commonwealth of Pennsylvania will desire relief at the hands of this Court against the project of the City of New York, if upon the hearing of this cause it develops

(*a*) That the proposed impounding and diversion will not be in accordance with a fair and equitable division of the waters of the Delaware River and its tributaries between the States of New Jersey and New York and the Commonwealth of Pennsylvania;

(*b*) That the project of the City of New York does not contemplate a proper release of impounded flood waters for the purpose of increasing the low water flow of the Delaware River;

(*c*) That the proposed impounding and diversion will work material damage to the present or reasonable future interests and needs of the Commonwealth of Pennsylvania, its municipalities and its inhabitants to the waters of the Delaware River and its tributaries for domestic and municipal water supply and sanitation, industrial water supply and the development of water power;

(*d*) That the adjudication proposed by either of the parties to the litigation should leave the State or City of New York free to pursue any unrestricted plan of impounding and diversion;

(*e*) That the adjudication proposed by either of the parties in this cause should foreclose the Commonwealth of Pennsylvania in the future from insisting that the project now to be carried out by the

City of New York shall constitute a prior appropriation which shall be taken reasonably into account in any subsequent or final allocation of the waters of the Delaware River and its tributaries between the States of New Jersey and New York and the Commonwealth of Pennsylvania.

Respectfully submitted,

COMMONWEALTH OF PENNSYLVANIA,
INTERVENOR,

By

CYRUS E. WOODS,
Attorney General.

OWEN J. ROBERTS,
Special Assistant to the Attorney General.

Solicitors for Intervenor.

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FEB 2 1931
CLERK

IN THE

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1930.

State of New Jersey, Plaintiff,
vs.
State of New York and City of New York, Defendants.
Commonwealth of Pennsylvania, Intervenor.

No. [redacted] riginal.

REPORT OF THE SPECIAL MASTER.

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I.

IN THE

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1930.

State of New Jersey, Plaintiff, *vs.* State of New York and City of New York, Defendants. Commonwealth of Pennsylvania, Intervenor.	No. 16, Original.

SUBMISSION OF THE REPORT OF THE SPECIAL MASTER.

In the above entitled cause this Honorable Court appointed me as Special Master by its order dated January 27th, 1930, as follows:

> "IT IS NOW HERE ORDERED by this Court that the said motion be, and the same is hereby, granted.
>
> "AND IT IS FURTHER ORDERED that CHARLES N. BURCH, Esquire, of Memphis, State of Tennessee, be, and he is hereby, appointed special master in this cause, with power to issue subpoenas for witnesses, and to take such evidence as may be introduced and such as he may deem necessary. The master is directed to make findings of fact and conclusions of law, and to submit the same to this Court with all convenient speed, together with his recommendations for a decree. The findings, conclusions, and recommendations of the special master shall be subject to consideration, rejection, revision, or approval by the Court."

In pursuance of said order I met counsel of all the parties in the City of New York on February 25th, 1930 and ar-

ranged to begin the taking of proof at Trenton, New Jersey on the following April 21st. I heard the proof of the State of New Jersey from April 21st to May 16th, 1930. I heard the proof of the State of New York and City of New York in New York City from June 16th to June 27th, 1930, and the proof of the Commonwealth of Pennsylvania in the City of Philadelphia from August 4th to August 13th, 1930. I heard the rebuttal proof of the State of New Jersey at Trenton, New Jersey from September 15th to September 19th, 1930, and at the same time heard the sur-rebuttal proof of the City of New York and Commonwealth of Pennsylvania. There were 43 full days given to the hearing of oral evidence. In addition, at the request of the parties, I made an inspection trip (lasting 6 days) of the Delaware River and its tributaries and Delaware Bay. This inspection trip lasted from September 8th to September 13th, 1930. On this trip I was accompanied by counsel for all the parties and their technical advisers. I heard oral argument at Memphis, Tennessee for four days from November 17th to November 20th.

The following is a statistical summary of the proceedings:

Number of days devoted to hearing evidence	43
Number of days devoted to inspection of river, tributaries and bay	6
Number of days spent in traveling to and from the places of hearing	10
Number of days devoted to hearing oral argument	4
Pages of evidence	7507
Number of witnesses heard	132
Number of exhibits introduced	435
Pages of printed briefs filed by parties	1197
Pages of requests for findings	97

I heard all the evidence offered by the parties to the case and in addition, on my own motion, asked the attendance of General George B. Pillsbury, Assistant Chief of Engineers of the United States Army, who testified as a witness of the Special Master, and who was cross-examined by all the parties.

Now, therefore, in pursuance of the above order of this court, I have reported the evidence and the exhibits received by me as Special Master, by filing the same in the office of the Clerk of this Court with my certificate; and I herewith submit to the court my findings of fact, conclusions of law and recommendations for a decree.

Respectfully submitted,

CHARLES N. BURCH,

Special Master.

II.

IN THE

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1930.

State of New Jersey, Plaintiff, *vs.* State of New York and City of New York, Defendants. Commonwealth of Pennsylvania, Intervenor.	No. 16, Original.

REPORT OF THE SPECIAL MASTER.

THE PLEADINGS.

On May 22, 1929, the State of New Jersey filed its original bill of complaint in this Court against the State of New York and City of New York. The bill was answered by the defendants State of New York and City of New York. The Commonwealth of Pennsylvania was permitted to intervene and filed a statement of its interest and the relief desired by it. On January 20, 1930 the cause came on for hearing under a motion previously made to set the cause for hearing on bill and answer. On this hearing the plaintiff was granted leave to withdraw its motion to set the cause for hearing on bill and answer and, on January 27, 1930, the order appointing the special master was entered.

The Bill.

The object of the suit is to enjoin the State of New York and the City of New York and all persons acting under their authority "from diverting or abstracting any waters from the Delaware River, or from any of its tributaries, and particularly from the Neversink River, Willowemoc River, Beaver Kill, East Branch of the Delaware River and Little Delaware River, or either, or any part of either of them."

The bill is filed by the State of New Jersey as one of the states of the United States, in its capacity as the owner of riparian lands on the Delaware River and Delaware Bay and also as parens patriae, to protect the interests of the State of New Jersey and the people of said State. The bill alleges that the Delaware River is an interstate stream, rising in the State of New York, and constitutes the boundary between the States of New York and Pennsylvania from a point near Deposit, New York to a point near Port Jervis, New York, the last mentioned point being known as Tri State Rock and said point being a corner of the states of New York, New Jersey and Pennsylvania; and that from Tri State Rock southwardly, the Delaware River constitutes the boundary between Pennsylvania and New Jersey to a point near Chester, Pennsylvania, and from said point near Chester, Pennsylvania, the Delaware River and Delaware Bay constitute the boundary between the States of New Jersey and Delaware.

The bill alleges that the Delaware River has certain tributaries located in the State of New York, to-wit: Neversink River, Willowemoc River, Beaver Kill, East Branch and Little Delaware, and that from these five tributaries the defendants propose at an expense of more than $272,000,000 to make the diversions of water complained of in the bill, such diversion being from the Delaware River watershed to the Hudson River watershed.

Plaintiff states that it is the riparian owner of 23.33 acres of land on the Delaware River located in the City of Trenton, said land being used by the State for its capitol

building and other purposes and that it is also the riparian owner of 292 acres of land at Washington's Crossing in Mercer County, said land being used as a public recreation park, and that below Trenton in the tidal portion of the Delaware River said plaintiff state owns the bed of the stream and bay to the center of the channel. It is alleged that the City of New York, acting under the authority claimed to have been conferred upon it by the State of New York, has completed plans and is about to begin the construction of dams in the tributaries above mentioned and from the waters so stored, said city, by means of tunnels and aqueducts, will divert to the water supply of the City of New York the equivalent of six hundred million gallons of water daily. The bill states the streams from which the proposed diversion is to be made, the location of the dams, the square miles of watershed above the dams and the quantity of diversion from each place of storage, as follows:

Stream	*Dam at*	*Watershed Sq. Miles Above Dams*	*Diversion (Gals. per Day)*
Neversink	Curry	70	70,000,000
East Branch of Delaware	Downsville	370	370,000,000
Beaver Kill	Beaver Kill	60	60,000,000
Willowemoc	Parkston	60	60,000,000
Little Delaware	Delhi	50	40,000,000
		Total	600,000,000

The bill alleges that the proposed diversion will irreparably injure the State of New Jersey and its people in a number of particulars. It is alleged that the proposed diversion:

(1) Will constitute an obstruction to and adversely affect the navigability and navigable capacity of the Delaware River, without the affirmative authority of Congress having been obtained, and without the authority of the Secretary of War and without the consent of the plaintiff.

(2) Will deprive the State and its citizens as riparian owners along the Delaware River of the natural, unobstructed and undiminished flow of its waters in violation of their rights under the common law as adopted and applicable in New York and New Jersey.

(3) Will injuriously affect water power rights of plantiff and plaintiff's citizens and the ability of plaintiff and its citizens to develop water power on the Delaware River.

(4) Will injuriously affect the sanitary condition of the Delaware River.

(5) Will injuriously affect the industrial use of Delaware River water.

(6) Will have the effect of increasing the salinity of the water in the lower part of Delaware River and in Delaware Bay so as to affect injuriously the planting and production of oysters, and the oyster industry generally in New Jersey.

(7) Will injuriously affect the shad fisheries in the Delaware River.

(8) Will injuriously affect the municipal water supply of towns and cities in New Jersey on the Delaware River.

(9) By lowering the level of the Delaware River will injuriously affect the farming and cultivation of lands on the Delaware River.

(10) Will injuriously affect the use of the river for recreational purposes.

The bill also alleges that the proposed diversion means the taking of water from the Delaware River watershed to the Hudson River watershed, and that the water so taken will never return to the Delaware River.

The bill further alleges that there is no necessity for this diversion as the City of New York has other available sources of water supply from intrastate streams within the State of New York as well as other sources and that water can be taken from these sources without being diverted from one watershed to another and without affecting any other state. Other sources of water supply are alleged to be the Hudson River and certain streams in the Hudson

River watershed in the State of New York, and ground waters on Long Island, and it is alleged that suitable water can be obtained from these sources in sufficient quantities.

The bill also alleges a wasteful use by New York City of its present water supply and an insufficient meterage of water used by New York City and that the water rates in New York have not been changed for more than half a century.

The bill also alleges that the carrying out of the plan of the City of New York will violate the Federal Water Power Act and that the proposed diversion will interfere with and regulate interstate commerce; will prefer the ports of the State of New York to the ports of the State of New Jersey, and will take the property of plaintiff and its citizens without due process of law—all in violation of the Constitution of the United States.

There are other allegations of the bill which will be more particularly noticed hereafter.

The bill alleges irreparable injury and prays for an injunction, as above stated.

The bill is filed in pursuance of and under authority of a resolution passed by the Legislature of New Jersey and approved by the Governor on April 16, 1929. (Exhibit 1).

The Answers.

The answers of the State of New York and City of New York generally deny the allegations of the bill, and particularly deny any injurious effect of the proposed diversion.

The answers, however, admit that the City of New York, acting under the authority of the State of New York, is preparing to construct the storage reservoirs mentioned in the bill; that said storage reservoirs are located entirely within the State of New York and more than 30 miles from the channel of the Delaware River where it constitutes the boundary between the States of New York and Pennsyl-

vania; that said storage reserviors are on streams wholly within the State of New York and that said streams are non-navigable; that the diversion of water will amount to two hundred and nineteen billion gallons per annum, which is the equivalent of diversion at the rate of six hundred million gallons per day; that said diversion, instead of being injurious, will be beneficial; that the substantial effect of the diversion is to take out of the river flood and waste waters which flow to the sea without being of benefit to anyone but on the other hand which are injurious; that the plan of the City of New York in addition to the diversion also provides that there shall be released from the storage reserviors every day during the months of July, August, September and October of every year a flow of water equal to .45 cubic feet per second for each square mile of drainage area above the point of storage, and that a similar release will be made on each dry day during the eight remaining months of the year, that is, on each day on which the flow from the drainage area above the point of stroage is less than .45 cubic feet per second per square mile of drainage area above said point of storage; that said releases of water from the reservoirs during the months of July, August, September and October and on other dry days during the remaining eight months will be of great benefit to the river and to all those owning lands along the river.

The answers also set up that the states of New York, New Jersey and Pennsylvania had appointed commissioners to prepare a compact governing the use and conservation of the waters of the Delaware River and of the tributaries thereof and that the commissioners of the three states had agreed upon a compact and that this compact was adopted by an act of the Legislature of the State of New York (chapter 177 of the Laws of New York of 1925), but that said compact was not adopted by the Legislatures of the states of New Jersey and Pennsylvania; that thereafter commissioners were again appointed by the three states

and a unanimous agreement was reached by these commissioners recommending a compact relative to the conservation and use of the waters of the Delaware river and the tributaries of the Delaware River, and that this second compact was adopted by the Legislature of the State of New York (Chapter 682 of the Laws of New York of 1927) but that this compact was not adopted by the Legislatures of New Jersey and Pennsylvania; and it is further alleged that the diversion proposed to be made from the tributaries of the Delaware River is in accordance with the principles of the compact last mentioned.

The answers also allege an imperative need of New York City for an additional municipal water supply.

Other allegations of the answers will be noticed hereafter.

Intervention of Pennsylvania.

The Commonwealth of Pennsylvania filed a statement of its interest and of the relief desired by it. In its statement of interest the Commonwealth of Pennsylvania alleges:

(1) That the interest of Pennsylvania in the water resources of the Delaware River and its tributaries lies in the development thereof through regulated control of storage and release of waters from impounding dams which will tend towards reduction of flood flows and the increase of low water flows and bring about the best utilization of said water resources;

(2) That a number of municipalities of Pennsylvania obtain their supply of water from the Delaware River and its tributaries and that in the future there will be greater need of water from said river and its tributaries for the supply of municipalities in Pennsylvania; that in particular the City of Philadelphia, which at present obtains its water supply from the Delaware River and the Schuylkill River, will have to go to the upper Delaware River and the tributaries of the upper Delaware River for additional water supply and that the application of the principles set forth in the bill of complaint of New Jersey will prevent the future development of the Delaware River and its tribu-

taries above tide water as a source of water supply for Philadelphia and other Pennsylvania municipalities.

(3) That Pennsylvania desires to cross-examine witnesses and, if necessary, present evidence on the question as to whether the proposed impounding and diversion by the City of New York will work material damage to Pennsylvania, its municipalities and its inhabitants and also present evidence disclosing the present and reasonable future needs of Delaware River water and water of the tributaries of Delaware River by Pennsylvania and its municipalities.

Pennsylvania, in its prayer for relief, states that it will desire relief at the hands of the court if, upon the hearing, it develops:

1. That the proposed impounding and diversion is not in accordance with the fair and equitable division of the water of the Delaware River and its tributaries among the States of New York, New Jersey and Pennsylvania.

2. Relief is asked if the plan of the City of New York does not contemplate a proper release of water for increasing the low water flow of the Delaware River.

3. Relief is asked if it develops that the proposed impounding and diversion will work material damage to the present or reasonable future interest and needs of Pennsylvania.

4. That it will ask relief against any unrestricted plan of the State or City of New York in the impounding and diversion of waters.

5. That it will also ask relief against any adjudication that any diversion allowed the City of New York shall constitute a prior appropriation and will insist that any such diversion shall be taken reasonably into account in any subsequent or final allocation of the waters of the Delaware River and its tributaries among the states of New York, New Jersey and Pennsylvania.

The above constitutes a very bare outline of the pleadings, and particular allegations of the pleadings will be noticed more fully hereafter.

III.

THE PROOF.

The proof, as already indicated, is most voluminous. In addition to the 7,500 pages of oral evidence, there were filed 435 exhibits. Some of these exhibits are volumes in and of themselves, containing more than 300 pages each. Necessarily much of the proof was technical in character. Expert hydraulic, water supply, and sanitary engineers were introduced by all parties. There was also proof from geologists, biologists and agricultural experts, and in addition many lay witnesses.

I take this occasion to testify to the high standing and character of the witnesses who were introduced. In my opinion every witness attempted to tell the truth as he understood it. I think there is no basis for an attack upon the credibility of any witness.

As the controversy is one among quasi-sovereign states and involves the welfare of millions of people, I adopted liberal rules in the admission of evidence.

To reflect this enormous mass of evidence, including the exhibits, in all of its details, would virtually amount to a rescript of the record and this I think would not be helpful to the court. I have been sorely troubled between making a report which is too long and in too much detail and making one which is too short or too inadequate to get properly the effect of the evidence before the court. I have, therefore, adopted a middle course by stating my conclusions and such references to the record as I thought would be helpful.

I also take this occasion to thank counsel and witnesses for their patience and indulgence in attempting to educate me in the technicalities of this case, and particularly do I express my gratitude to counsel for their courtesy and for the facilities which they furnished for satisfactory hearings of the proof.

IV.

JURISDICTION OF THE COURT.

I entertain no doubt as to the justiciableness of this controversy and the jurisdiction of the Court. Article III, Section 2, Constitution of the United States; Section 341, Title 28, U. S. C. A. (p. 171); *Kansas* v. *Colorado,* 206 U. S. 46; *Wyoming* v. *Colorado,* 259 U. S. 419; *Wisconsin* v. *Illinois,* 278 U. S. 367; *Georgia* v. *Tennessee Copper Co.,* 206 U. S. 230; *Pennsylvania* v. *Wheeling & Belmont Bridge Co.,* 54 U. S. 518; *New York* v. *New Jersey,* 256 U. S. 296.

V.

THE APPLICABLE PRINCIPLES OF LAW — COMMON LAW — INTERSTATE COMMON LAW.

Sections 13, 14, 15, 16, 44, 45, 50, and 55 of the bill are as follows:

> "13. Between the Atlantic Ocean and the City of Trenton, the bed of said bay and river, from the center of the channel thereof to the highwater mark on the New Jersey shore, is owned in fee simple by the plaintiff, except such portions thereof as it may have conveyed to its citizens for the erection of docks, wharves and piers and other industrial or commercial uses. From Trenton to the northern boundary of the State, the bed of the stream, between the centre of the channel thereof and the New Jersey shore, is owned by citizens of the plaintiff who are the riparian proprietors, subject only to the easement of the public to use said river as a public highway.
>
> "14. The plaintiff is the riparian proprietor of 23.33 acres of land in the City of Trenton, located on and extending to and, for a distance of 450 feet along, the centre of the channel of said Delaware River, used and occupied since November 25, 1790, by its Capitol building and other structures, as the seat of government of the plaintiff.

"15. The plaintiff is also riparian proprietor of 292 acres of land in the Township of Ewing, Mercer County, New Jersey (known as Washington's Crossing), located on and extending to and, for a distance of 2,000 feet along, the centre of the channel of said river, which land, together with the buildings and other structures thereon, are used by its citizens as a public recreation park.

"16. The State of New Jersey originally adopted, and still maintains the rule of the common law with respect to the rights of riparian proprietors along, in and to waters and water courses. The legislative policy of the plaintiff has been and is to preserve and administer its water rights for the benefit of its people, to whom by right of proximity and sovereignty they naturally belong. The citizens of plaintiff who are riparian proprietors along the Delaware River have vested property rights in the water of the stream and the right to enjoy it without diminution or alteration, growing out of the ownership of the soil, which rights are as carefully protected by law as the soil itself. The same common law rule was adopted and is in force in the State of New York and the Commonwealth of Pennsylvania.

"44. The diversion of all or any substantial portion of water from the watershed in question will measurably, appreciably and substantially diminish the flow of the Delaware River throughout its course both in the tidal and non-tidal portions thereof within the territorial limits of the plaintiff and will cause permanent and irreparable injury to the plaintiff and its citizens.

"45. Said proposed diversion will result in great damage to the vested rights and property of the plaintiff and its citizens, for the compensation of which there is no provision or remedy at law, either through proceedings in condemnation or otherwise. Said proposed diversion, if carried out as now threatened by the defendants, will cause great and irreparable damage to vested rights and property of the plaintiff and its citizens for the prevention of which there is no means or remedy save by injunction issued out of this Honorable Court.

"50. Said proposed diversion will deprive the plaintiff and its citizens, as owners of the bed of Delaware

Bay and Delaware River, and as riparian proprietors along and in said river, of the natural, unobstructed and undiminished flow of the waters of said rivers, in violation of the rules of the common law as adopted and applied in and by this court and in and by the courts of the States of New York and New Jersey.

"55. Said proposed diversion will transfer water in large volume from one great watershed to another; to-wit, from the Delaware River watershed to that of the Hudson River, contrary to the rules of the common law and to the rules of law established and observed in this Court and in the courts of the States of New Jersey and New York."

It may be pertinent at the outset to inquire what is the common law rule of riparian rights. It is thus stated in *United States* v. *Rio Grande Dam and Irrigation Company*, 174 U. S. 702:

"The unquestioned rule of the common law was that every riparian owner was entitled to the continued natural flow of the stream. It is enough, without other citations or quotations, to quote the language of Chancellor Kent (3 Kent, sec. 439):

" 'Every proprietor of lands on the banks of a river has naturally an equal right to the use of the water which flows in the stream adjacent to his lands, as it was wont to run (currere solebat) without diminution or alteration. No proprietor has a right to use the water, to the prejudice of other proprietors, above or below him, unless he has a prior right to divert it, or a title to some exclusive enjoyment. He has no property in the water itself, but a simple usufruct while it passes along. *Aqua currit et debet currere ut currere solebat* is the language of the law. Though he may use the water while it runs over his land as an incident to the land he cannot unreasonably detain it, or give it another direction, and he must return it to its ordinary channel when it leaves his estate.'

"While this is undoubted, and the rule obtains in those states in the Union which have simply adopted the common law, it is also true that as to every stream within its dominion a *state may change this common-law rule and permit the appropriation of the flowing waters for such purposes as it deems wise.*"

The common law rule of riparian rights prevails in New Jersey. In *McCarter* v. *Hudson County Water Co.*, 70 N. J. Eq. 527, it is said:

> "Thus it appears from immemorial times running water, as one of the elements of life, health and comfort, has been esteemed common property, subject to usufructuary use by the owners of land over which it passed, a use which, by legal construction based upon public needs, has been from time to time enlarged to meet the demands of civilization and preserve the peace of society, but it has never been extended to the point of absolute ownership, to the detriment of a lower landowner. If diverted, it must be returned undiminished, except as to the incidental waste made necessary by the personal private use, for domestic and other recognized lawful purposes appertaining to the land and its occupant."

To the same effect is the decision of the same case on appeal to the Court of Errors and Appeal of New Jersey. See *McCarter* v. *Hudson County Water Company*, 70 N. J. Eq. 695. The same case was afterwards before this Court in *Hudson County Water Company* v. *McCarter*, 209 U. S. 349, wherein this court said:

> "The private right to appropriate is subject not only to the rights of lower owners, but to the initial limitation that it may not substantially diminish one of the great foundations of public welfare and health."

See also *Attorney-General* v. *Delaware and Bound Brook R. R. Co.*, 27 N. J. E., p. 1; *Sparks Mfg. Co.* v. v. *Town of Newton*, 57 N. J. E. 367; s. c. 60 N. J. E. 399; *Paterson* v. *E. Jersey Water Co.*, 74 N. J. E. 49; s. c. 77 N. J. E. 588.

The New York rule is thus stated by the Court of Appeals of New York in *Strobel* v. *Kerr Salt Co.*, 164 N. Y. 303:

> "A riparian owner is entitled to a reasonable use of the water flowing by his premises in a natural stream, as an incident to his ownership of the soil, and to have it transmitted to him without sensible alteration in quality or unreasonable diminution in quantity.

While he does not own the running water, he has the right to a reasonable use of it as it passes by his land. As all other owners upon the same stream have the same right, the right of no one is *absolute*, but is qualified by the right of the others to have the stream *substantially* preserved in its natural size, flow and purity, and to protection against material diversion or pollution. This is the common right of all, which must not be interfered with by any. The use by each must, therefore, be consistent with the rights of the others, and the maxim of *sic utere tuo* observed by all. The rule of the ancient common law is still in force; *aqua currit et debet currere, ut currere solebat.* Consumption by watering cattle, temporary detention by dams in order to run machinery, irrigation when not out of proportion to the size of the stream, and some other familiar uses, although in fact a diversion of the water involving some loss, are not regarded as an unlawful diversion, but are allowed as a necessary incident to the use in order to effect the highest average benefit to all the riparian owners. As the enjoyment of each must be according to his opportunity and the upper owner has the first chance, the lower owners must submit to such loss as is caused by reasonable use. Surrounding circumstances, such as the size and velocity of the stream, the usage of the country, the extent of the injury, convenience in doing business and *the indispensable public necessity of cities and villages for drainage,* are also taken into consideration, so that a use which, *under certain circumstances, is held reasonable, under different circumstances would be held unreasonable.* It is also material, sometimes, to ascertain which party first erected his works and began to appropriate the water." (Cases cited); (See also Pierson *v.* Speyer, 178 N. Y., 270, 273.)

Again, in *United Paper Board Co.* v. *Iroquois Pulp & Paper Company,* 226 N. Y. 38, the court said:

"The rule of law is familiar that each owner of land contiguous to a natural watercourse has a right, as owner of such land and as naturally connected with and incident to it, to the natural flow of the stream along his land and its descent, and all the force to be derived

therefrom for any domestic or hydraulic purpose to which he may decide to apply it. He may, by means of a ditch or conduit, withdraw water from the stream and cause it to flow unnaturally through his land for agricultural, industrial or other purpose, provided he causes it, in its *substantial* volume, to return upon his land to the stream. In order that he may enjoy those rights every owner is bound to use the water reasonably as it flows, so as not to injure the equal rights of all the owners. Whether or not a use or detention of the water is reasonable must be determined by the *extent and capacity of the stream*, the uses to which it is and has been put, and the rights that other owners on the stream have. The essential question in each particular case is what is reasonable under the conditions and circumstances there presented. Those are riparian rights, are natural and inherent, and a part of the estate of each riparian owner."

And in regard to the right of the City of New York to take the waters of Esopus creek for a water supply, the Court of Appeals of New York in *Matter of Van Etten* v. *City of New York*, 226 N. Y. 483 said:

"The City of New York could lawfully take or acquire the right of the riparian owner to the natural and usual flow of the waters of Esopus creek only through and by means of the exercise of the right of eminent domain. Until the city took or acquired the title to the right any interference by the city with it was a wrong and a trespass. The right of the owner of riparian land to the natural flow of water in a stream along the land is a corporeal hereditament and is an incident to and is annexed to the land as part and parcel of it. It is not, and is more than, an easement. The right is usufructuary. It is properly classified at common law, equally with the land itself, as real property. . . . The claimant as the owner of lands riparian to Esopus creek owned the right, as a part of his real estate, as a part of his lands, to have the waters flow along the lands and the City of New York could not take or acquire that right—could not lawfully and rightfully divert or destroy the flow—otherwise than

through the exercise of the right of eminent domain as authorized by and pursuant to the Constitution of the state, the statutes in question, or the relevant sections (Sections 3357-3384) of the Code of Civil Procedure."

In Pennsylvania the rule seems to be similar. In *Palmer Water Company* v. *Lehighton Water Co.*, 280 Pa. St. 492, the court said:

> "Water, like air, is one of the principal necessities of life, its place, as related to the public generally among our so-called commodities, is one of the utmost importance. Its use, and the law relating to its protection and conservation, is of greater importance in those sections where, because of the many mountain chains passing through our State, the configuration of the earth's surface is such that the supply during certain seasons becomes very limited. As a matter of public policy, the use of the waters of the state, subject to capture, should be so regulated as to conserve the supply to the best advantage, and be so separated between different localities as to effect the greatest possible good.
>
> "Since very early in the Commonwealth's history we held that water, as it flows in the various water courses, is not the subject of absolute ownership except by designated methods. Every riparian owner is entitled to use so much of a stream running by or through his lands as may be necessary for domestic needs or other similar purposes. *The use for extraordinary purposes must be such as will not sensibly or materially diminish the quantity*; Consolidated Water Supply Co. *v.* State Hospital for Criminal Insane, 66 Pa. Superior Ct. 610, 620, and authorities there cited; Com. *v.* Emmers, 221 Pa. 298, 303."

It should be stated, however, that the common law rule of riparian rights in New York has this exception, that it does not apply along the streams upon the banks of which the Dutch settled. These streams are the Hudson and Mohawk. *Smith* v. *City of New York*, 92 N. Y. 463. The common law, however, appears to prevail in New York so far as the Delaware River is concerned. See *In Re. Delaware River at Stilesville*, 115 N. Y. Supp. 745. In that case the court said:

"The water which flows over the lands of a person is not his property, and at most he has a mere usufructuary right therein, and must so use it as to not unnecessarily and unreasonably impair its usefulness by other riparian owners."

It should also be noted that in Pennsylvania the riparian proprietor on the Delaware (and several other large streams) does not own the bed of the stream to the channel of the river. The proprietorship is in the State. *Rundle* v. *Delaware and Raritan Canal Company*, 14 Howard, 80.

I find that, as stated in the bill, the State of New Jersey is the owner of the bed of Delaware Bay and of the bed of the tidal portion of Delaware River adjacent to its shores and extending to the center of the channel. In the non-tidal portion of the Delaware River above Trenton Falls the State is the riparian owner where its Capitol grounds are located and where Washington Park is located. Numerous individuals and corporations own the remainder of the New Jersey shore between Trenton Falls and Tri State Rock. In this non-tidal section of the river, the riparian owners in New Jersey, under New Jersey law, own the bed of the stream to the center of the channel, that is, to the boundary line separating New Jersey and Pennsylvania.

It seems to me quite clear therefore, that if the strict rule of the common law is the rule of law which is applicable, it must necessarily follow that New Jersey is entitled to an injunction since under the New York plan the river will not flow in undiminished volume as it has been accustomed to flow but will be reduced in volume to the extent of the equivalent of 600 million gallons daily. This conclusion is subject to the condition that New Jersey will be substantially injured by the diversion as an injunction will not issue to protect a mere abstract right. *North Dakota* v. *Minnesota*, 263 U. S. 365; *New York* v. *New Jersey*, 256 U. S. 296.

It is also true that the City of New York is not a riparian proprietor on the Delaware River or on its branches, but

it does not seem to me that it is particularly material whether New York City is or is not a riparian proprietor. The question with New Jersey is as to the effect of the diversion and it matters not to New Jersey whether that diversion be made by a riparian or non-riparian owner, the only interest of New Jersey being the effect on New Jersey.

I do not think, however, that the court is confined to a view of the common law only, to determine whether the proposed diversion should be enjoined. I think the statute law and the public policy of the three states and the principles of interstate common law as announced by this court are also to be considered.

I find that each of the three states permits municipalities to make diversion of waters for the purpose of supplying municipalities. In such instances, however, provision is made for compensation to those whose riparian rights are taken. *Higgins* v. *Flemington Water Co.*, 36 N. J. E. 583; *Acquackanonk Water Co.* v. *Watson*, 29 N. J. E. 366; *Smith* v. *City of Rochester*, 92 N. Y. 463; *Stamford Water Co.* v. *Stanley*, 39 Hun. (N. Y. 424; *Palmer Water Co.* v. *Lehighton Water Co.*, 280 Pa. St. 492.

The laws of a state granting the right to a municipality to condemn riparian rights or otherwise make compensation, of course, have no extraterritorial effect, and cannot operate beyond the state boundary. In the case of the diversion herein involved, it appears that the proposed diversion will be made entirely in accordance with the laws of New York and, so far as New York is concerned, will be entirely lawful. Chapter 724 of the Laws of New York of 1905 (as amended) and Section 522, Article XI of the Conservation Law of the State of New York provide "for the payment of the proper compensation for any and all legal damages to persons or property, whether direct or indirect, which will result from the acquiring of said lands and the execution of said plans". There is no doubt, therefore, that the City of New York, if permitted to carry out its plan, must make compensation to those who may

be injured from a legal standpoint. But these laws of New York, while authorizing the diversion involved herein and making said diversion lawful so far as New York is concerned, do not have any effect in New Jersey and cannot legalize the damaging of property in New Jersey.

It is true that in the argument of the case before me counsel for New York expressed the ability and willingness of the City of New York to pay damages to anyone injured in New Jersey, though at the same time denying that there would be any injury to anyone in New Jersey, or to anyone in New York owning property anywhere near the New Jersey line. The willingness, however, to pay compensation in New Jersey would not render lawful or rightful the taking of property or the injuring of property in New Jersey. In other words, one is not at liberty to injure another merely by showing an ability and willingness to pay damages. *City of New York* v. *Pine*, 185 U. S. 107.

A case much in point is that of *Octoraro Water Company's Petition*, 15 Pennsylvania District Reports, 767. In that case the water company had legislative authority to dam a stream in Pennsylvania and to condemn lands for that purpose. The stream flowed into Maryland and the dam, though constructed in Pennsylvania, injured riparian rights in Maryland. The Pennsylvania court said:

> "Such a statute of one state to confer the power of condemning lands situated in another state for public purposes is ineffective. In Randolph on Eminent Domain, Sec. 28, page 27, it is said: 'It is, of course, inconceivable that a sovereign should contemplate the direct expropriation of property within a foreign state. Such action would be clearly unwarrantable.' A state cannot enact a statute purporting to authorize property to be taken beyond its boundaries, and deny a remedy unless the owner resort to and thereby ratify the statute by securing his compensation pursuant to it. In such case, the state seizes by wrong and without constitutional right, under the color of the statute and insists that the offended person shall waive the tort and declare the tortious act a valid act by seeking his

remedy under the very statute which, as to him, is void and ineffective; Pine *v.* Mayor, etc. of City of New York, 12 Fed. Repr. 98."

And in the case of *Pine* v. *Mayor of New York,* 112 Fed. 98, the Circuit Court of Appeals for the Second Circuit said in regard to the diversion by New York City of waters flowing into Connecticut:

> "A state cannot enact a statute purporting to authorize property to be taken beyond its boundaries, and deny a remedy to a person wronged unless he resort to and thereby ratify the statute by securing his compensation pursuant to it. In such case the state seizes by wrong and without constitutional right under the color of statute, and insists that the offended person shall waive the tort, and declare the tortious act a valid act, by seeking his remedy under the very statute which as to him is void and ineffective. The wrongdoer thus by sheer might commits an actionable wrong, and shields itself from answering therefor, unless pursuant to the statutory command by which the wrong was ordered done."

The *Pine* case was afterwards reversed by this Court (185 U. S. 93) but on an entirely different point.

I am of the opinion, therefore, that the ability and willingness of New York City to pay damages to those suffering damage in New Jersey, would not prevent the granting of an injunction, if New Jersey will be irreparably injured as stated in the bill.

I have mentioned the matter of diversions in the three states for the benefit of municipal water supplies, as indicating the policy of the three states in that regard. Looking further, however, I find that the public policy of each of the three states has permitted diversions from one watershed to another watershed of somewhat similar character to the proposed diversion involved in the instant case. The State of New Jersey has permitted for many years the diversion of water from the Delaware River into the Delaware and Raritan Canal which extends from the Delaware

River across the State of New Jersey to Raritan Bay on the Atlantic Ocean. Mr. Thaddeus Merriman, Chief Engineer of the New York City Board of Water Supply testified as follows:

"Q. Are you familiar with the diversions of water from the Delaware River?

"A. Yes, sir.

"Q. Name and describe one of them.

"A. At Bull's Island, about 22 miles above Trenton, the Delaware and Raritan Canal, by means of a feeder canal takes water from the Delaware River and conveys and delivers this water into the Delaware and Raritan Canal. This feeder constitutes the main water supply of the summit level of the Delaware and Raritan Canal and a substantial amount of water passes eastward and finds its way into the Raritan River, which, in turn, flows into Raritan Bay and thence into the Atlantic Ocean on the east coast of New Jersey. That line of canal is shown in blue extending from Trenton toward the northeast to New Brunswick and from there to the southwest to Raritan Bay." (pp. 5164-5.)

He also testified as to the same diversion as follows:

"Q. Do you know how much water the canal uses?

"A. The reports of the Geological Survey—

"Q. What year?

"A. For the years 1913 and 1922 indicate the use of 160 cubic feet per second; 1923 indicates the same amount, as does 1924. 1925 140 cubic feet per second. 1926 130 cubic feet per second, and 1927 130 cubic feet per second; also 1928, and for 1929 the figure is 90 cubic feet per second.

"Q. Does that include the amount of water that flows both east and west

"A. Yes, sir.

"Q. How much is taken from the Delaware River?

"A. All of the water in the quantities that I have just stated comes from the Delaware River.

"Q. You mean that the diversion from the Delaware River constitutes the entire water used in the canal throughout its length?

"A. No. I said a moment ago that some of it went toward the east and some other quantity of it goes back into the Delaware River down near Bordentown.

"Q. What is the net result of the amount taken from the Delaware River for that canal?

"A. I should say it would be substantially about one-half of the quantities I have just stated." (pp. 5194-5.)

(See New Jersey Act of February 4, 1830, incorporating Delaware and Raritan Canal Company.)

He also gave an instance of another New Jersey diversion in the case of the Morris and Essex Canal extending from Phillipsburg, New Jersey, across the State of New Jersey to Newark Bay on the Atlantic Ocean. He said that canal derived its main water supply from Lake Hopatcong, which is in the watershed of the Musconetcong River (a tributary of the Delaware), and that a part of the water from this lake which was fed into the summit level of the Morris and Essex Canal went east to the Atlantic Ocean and a part went west to the Delaware River. This canal has now been abandoned but was in use for many years. (See Laws of New Jersey for 1824, p. 158, incorporating the Morris Canal and Banking Company.)

He also called attention to a diversion by the City of Jersey City, New Jersey, as follows:

"Q. Do you know of any diversion from one watershed to another that is made wholly within the State of New Jersey?

"A. Yes; sir. I am familiar with the diversion made by the City of Jersey City from its reservoir at Boonton on the Rockaway River, a tributary of the Passaic River. The aqueduct extending from this reservoir and leading to Jersey City removes this water in a volume exceeding 50 million gallons daily. Very little, if any, of this water is ever returned to the watershed of the Rockaway River or the Passaic River, of which the Rockaway is a tributary." (p. 5171.)

Similar diversions have been practiced in New York and Pennsylvania. In New York water was diverted from Port

Jervis, New York, in the Delaware River watershed, to Kingston, New York in the Hudson River watershed. This diversion was through the Delaware and Hudson canal, which was in use for many years but has now been abandoned. In Pennsylvania there has been permitted the diversion of the waters of the Lehigh River into a canal extending from Easton, Pennsylvania to Bristol, Pennsylvania. Mr. Merriman said in regard to this diversion:

> "The Lehigh Division of the Pennsylvania Canal diverts water from the Lehigh River, a tributary of the Delaware, at Easton, Pa. This water is removed from the Lehigh River by means of a dam constructed across that river just about the point where it enters the Delaware. The water of the Lehigh is thus diverted into the canal, which is above the level of the Delaware River, and is carried along and not delivered back into the Delaware until the canal connects with the river at Bristol, Pa." (p. 5170).

The record contains instances of several other diversions. The matter of diverting water from one watershed to another, or of diverting water from a river and not returning it to the same river for a long distance below, is therefore not an unknown practice in the three states which are parties to this litigation, though the diversion here involved is much greater than any of the diversions above mentioned.

Having now stated the common law of the three states as to riparian rights, also the policy of the three states permitting municipalities to divert water for a municipal water supply, and the policy of the three states in permitting the diversion of water for canal and other purposes—in some instances from one watershed to another watershed, the question now recurs as to *what principles of law should be applied* in determining whether the proposed diversion by New York City should be enjoined. I think the answer is to be found in the decisions of this court. In *Kansas* v. *Colorado*, 206 U. S. 46 there was a bill filed by the State of Kansas to enjoin the State of Colorado in the diversion of

waters of the Arkansas River. In determining what principles of law should control in that case this court said:

> "And in delivering the opinion on the demurrer in this case Chief Justice Fuller said (p. 146, L. ed. p. 846, Sup. Ct. Rep. p. 560):
>
> " 'Sitting, as it were, as an international, as well as a domestic, tribunal, we apply Federal law, state law, and international law, as the exigencies of the particular case may demand.'
>
> "One cardinal rule, underlying all the relations of the states to each other, is that of equality of right. Each state stands on the same level with all the rest. It can impose its own legislation on no one of the others, and is bound to yield its own views to none. Yet, whenever, as in the case of Missouri *v.* Illinois, supra, the action of one state reaches, through the agency of natural laws, into the territory of another state, the question of the extent and the limitations of the rights of the two states becomes a matter of justiciable dispute between them, and this court is called upon to settle that dispute in such a way as will recognize the equal rights of both and at the same time establish justice between them. In other words, through these successive disputes and decisions this court is practically building up what may not improperly be called interstate common law."

It is to be noted that this court states that in these controversies between states "this court is practically building up what may not improperly be called interstate common law."

I am, therefore, of the opinion that this case is not to be decided according to the common law of New Jersey, New York or Pennsylvania, but in accordance with interstate common law as determined by this court.

In the case of *Kansas* v. *Colorado*, the bill was filed by Kansas to enjoin Colorado from making and continuing diversions of water from the Arkansas River for purposes of irrigation. In Kansas the common law rule as to riparian rights prevailed, though Kansas also recognized diversion for irrigation. In Colorado the common law rule did

not apply but Colorado recognized the doctrine of prior appropriation. In disposing of this case the court found that while some perceptible injury had been done to Kansas by the diversions already made, yet to the great body of the Arkansas river valley in Kansas little or no damage had been done, and that the drafts upon the Arkansas River made by Colorado were not unreasonable in extent. Said the court:

> "... while the influence of such diminution has been of perceptible injury to portions of the Arkansas valley in Kansas, particularly those portions closest to the Colorado line, yet, to the great body of the valley it has worked little, if any, detriment, and *regarding the interests of both states*, and the right of each to receive benefit through irrigation and *in any other manner* from the waters of this stream, we are not satisfied that Kansas has made out a case entitling it to a decree. At the same time it is obvious that if the depletion of the waters of the river by Colorado continues to increase there will come a time when Kansas may justly say that there is no longer an *equitable division of benefits*, and may rightfully call for relief against the action of Colorado, its corporations and citizens, in appropriating the waters of the Arkansas for irrigation purposes."

And in the same case this court, in describing the nature of the suit, said:

> "The controversy rises, therefore, *above a mere question of local private right and involves a matter of state interest, and must be considered from that standpoint.* Georgia *v.* Tennessee Copper Co., 206 U. S. 230, post, 1038, 27 Sup. Ct. Rep. 618.
>
> "This changes in some respects the scope of our inquiry. It is not limited to the simple matter of whether any portion of the waters of the Arkansas is withheld by Colorado. We must consider the effect of what has been done upon the conditions in the respective states, and so adjust the dispute upon the *basis of equality of rights as to secure as far as possible to Colorado the benefits of irrigation without depriving*

Kansas of the like beneficial effects of a flowing stream.''

Applying the principle of the last excerpt, the problem here is to adjust the dispute so as to secure to New York the benefit of the use of the tributaries of the Delaware for municipal water supply and at the same time not deprive New Jersey of the benefits of a flowing stream.

Of course, in applying the decision in *Kansas* v. *Colorado* to the question involved in the instant case, it is to be borne in mind that in *Kansas* v. *Colorado* there was not involved a controversy between common law states but between one state recognizing the common law of riparian rights and another state recognizing the doctrine of prior appropriation. It is also to be remembered that the diversion involved in *Kansas* v. *Colorado* was not one which was threatened but one which had been practiced for many years and that diversion was not one from one watershed to another.

The case of *Wyoming* v. *Colorado*, 259 U. S. 419 did involve a diversion from one watershed to another. The controversy there, however, was between two states neither of which applied the common law rule of riparian rights but both of which recognized the doctrine of prior appropriation. In that case, the case of *Kansas* v. *Colorado* was reviewed and was referred to as a ''pioneer in its field''. Referring to it this court (p. 464) said:

> ''On some of the questions presented it was intended to be and is comprehensive, and on others it was intended to be within narrower limits, the court saying: 'The views expressed in this opinion are to be confined to a case in which the facts and the local law of the two states are as here disclosed.' On full consideration it was broadly determined that a controversy between two states over the diversion and use of waters of a stream passing from one to the other 'makes a matter for investigation and determination by this court,' in the exercise of its original jurisdiction, and also that the upper state on such a stream does not have such ownership or control of the waters flowing therein as entitles

her to divert and use them regardless of any injury or prejudice to the rights of the lower state in the stream. And, on consideration of the particular facts disclosed and the local law of the two states, it was determined that Colorado was not taking more than what, under circumstances, would be her share *under an equitable apportionment.*"

This court also said:

"What was there said about 'equality of right' refers, as the opinion shows (p. 97), not to an *equal division of the water,* but to the equal level or plane on which all the states stand, in point of power and right, under our constitutional system."

In the same case this court further says:

"The contention of Colorado that she, as a state, rightfully may divert and use, as she may choose, the waters flowing within her boundaries in this interstate stream, regardless of any prejudice that this may work to others having rights in the stream below her boundary, cannot be maintained. The river, throughout its course in both states, is but a single stream wherein each state has an interest which should be respected by the other."

And in regard to the proposed diversion from one watershed to another, the court said:

"The objection of Wyoming to the proposed diversion on the ground that it is to another watershed, from which she can receive no benefit, is also untenable. The fact that the diversion is to such a watershed has a bearing in another connection, but does not in itself constitute a ground for condemning it. In neither state does the right of appropriation depend on the place of use being within the same watershed. Diversions from one watershed to another are commonly made in both states, and the practice is recognized by the decisions of their courts. Coffin *v.* Left Hand Ditch Co., 6 Colo. 443, 449; Thomas *v.* Guiraud, 6 Colo. 530; Hammond *v.* Rose, 11 Colo. 524, 7 Am. St. Rep. 258, 19 Pac. 466; Oppenlander *v.* Left Hand Ditch Co., 18 Colo. 142, 144,

31 Pac. 854; Moyer *v.* Preston, 6 Wyo. 308, 321, 71 Am. St. Rep. 914, 44 Pac. 845; Willey *v.* Decker, 11 Wyo. 496, 529-531, 100 Am. St. Rep. 939, 73 Pac. 210. And the evidence shows that diversions are made and recognized in both states which in principle are not distinguishable from this; that is, where water is taken in one state from a watershed leading into the other state, and conducted into a different watershed, leading away from that state, and from which she never can receive any benefit. *The principle of such diversions being recognized in both states, its application to this interstate stream does not, in itself, afford a ground for complaint, unless the practice in both be rejected in determining what, as between them, is reasonable and admissible as to this stream, which we think should not be done.*"

The court then proceeds to examine the facts of the case to determine whether the proposed diversion was unreasonable, and ascertained and determined on the facts the extent to which it was unreasonable.

While the controversy in *Wyoming* v. *Colorado* was not between common law states but between states recognizing the doctrine of prior appropriation, yet I think that certain general principles are announced which would be applicable to any controversy between states (whatever law each state recognizes) and these principles seem to me to be: *first,* the equality of right of the states of the Union, that is, the equal plane or level on which all the states stand "in point of power and right under our constitutional system"; *second,* that a river which flows through more than one state "is but a single stream wherein each state has an interest which should be respected by the other" and that each state has a right to enjoy the benefits of the stream; *third,* the court will examine the facts in each case to determine whether a state is attempting to obtain an unreasonable share of the benefits of the interstate stream, and whether a proposed diversion will, in view of the right of each state to enjoy the stream, result in a state receiving more than its just share of the benefits of the stream. In

other words, I am of the opinion that the doctrine of equitable apportionment announced in *Wyoming* v. *Colorado* is one of general application regardless of whether the contesting states recognize the strict common law rule of riparian rights or some other rule of law.

In *Wisconsin* v. *Illinois*, 278 U. S. 367 there was involved the diversion of the waters of Lake Michigan into the Chicago River (the flow of which had been reversed so as to carry away the sewage of the City of Chicago into the Des Plaines River and thence into the Mississippi River, that is, a diversion from one watershed to another). The diversion was enjoined on the ground that the effect of the diversion was to reduce the navigable capacity of the Great Lakes. A limited amount of water, however, was allowed to be diverted as an aid to navigation in the Chicago River. This same case again came before the court and is reported in 281 U. S. 179. In the last report of the case the complaining states asked for an injunction not only against diversion for the purposes of carrying away the sewage of Chicago, but also asked that the City of Chicago be required to return to Lake Michigan as purified sewage the water taken from the lake for municipal and domestic purposes. The court, however, found that the water taken from the lake for domestic purposes (referred to as "domestic pumpage") was not embraced within the scope of the bill of complaint—as stated by the court "a demand not contemplated by their bill". The court says:

> "The master estimates that with efficient operation the proposed treatment should reach an average of 85 per cent purification and probably will be 90 per cent or more. Even so we are somewhat surprised that the complainants should desire the effluent returned. The withdrawal of water for domestic purposes is not assailed by the complainants and we are of opinion that the course recommended by the master is more reasonable than the opposite demand. If the amount withdrawn should be *excessive*, it will be open to complaint. Whether the right for domestic use extends to great industrial plants within the district has not been

argued, but may be open to consideration at some future time."

I note that in the second report of the Special Master in *Wisconsin* v. *Illinois,* he says:

> "Furthermore, it is not regarded as open to serious question that the City of Chicago, under authority of the State, has the riparian right to take water from Lake Michigan for the ordinary uses of its inhabitants. That would not be, per se, an unreasonable use. And if it were sought to prevent an abuse of that right through the taking of an *unreasonable amount,* it would be necessary to present that issue in an appropriate manner." (p. 121.)

And he further says:

> "If the City of Chicago is entitled to take its water supply from Lake Michigan for the ordinary and reasonable uses of its inhabitants, it cannot be said that the State or the City is subject *to any established rule of law* which requires it to turn into the Lake what is no longer water but sewage or the effluent of sewage treatment plants." (p. 121.)

The litigation in *Wisconsin* v. *Illinois* was between common law states, and I think it a fair inference from what has been stated above that the court would have held, if the issue had been properly presented, that the City of Chicago has the right to take water for "domestic pumpage" from Lake Michigan and not return such water as purified sewage to the lake, provided the quantity taken be not so excessive as seriously to injure other states. In any event, the fact is, as shown by the opinion in *Wisconsin* v. *Illinois,* that the City of Chicago is daily taking a very large quantity of water from Lake Michigan for domestic purposes and is not returning that water to Lake Michigan but sending the water (as purified sewage) into another watershed. The opinion in *Wisconsin* v. *Illinois* does not show how many cubic feet per second are taken by Chicago for domestic pumpage. The quantity of water taken must be very large

in view of the population of Chicago, and some indication of the quantity taken is indicated by the following excerpt from the opinion in 281 U. S. 200:

> "Perhaps the complainants would not be very insistent with regard to the 1,000 or 1,500 c. f. s. which earlier in this case they seemed to admit to be reasonable, if their demand were allowed that the domestic pumpage be purified and returned to the lake—a demand not contemplated by their bill."

A Question of Degree.

Reverting again to the common law of riparian rights, I do not understand that the rule in New Jersey, New York or Pennsylvania is so strict that the volume of water flowing in a stream cannot be diminished to any extent whatsoever; even the common law rule contemplates that there is some loss of water to the stream in the reasonable uses permitted by the common law. Thus in *McCarter* v. *Hudson County Water Company*, 70 N. J. E. 527 it is stated that water must be returned to the stream undiminished "except as to the incidental waste made necessary by the personal private use for domestic and other recognized lawful purposes". Likewise in *Clinton* v. *Myers*, 46 N. Y. 511, it is said:

> "I do not mean to be understood as holding the doctrine that there can be no diminution whatsoever, and no obstruction or impediment whatsoever, by a riparian proprietor in the use of the water as it flows, for that would be to deny any valuable use of it. There may be and there must be allowed, of that which is common to all, a reasonable use. The true test of the principle and extent of the use, is whether it is to the injury of the other proprietors or not. There may be a diminution in quantity, or retardation or acceleration of the natural current, indispensable for the general and valuable use of the water, properly consistent with the existence of the common right. The diminution, retardation or acceleration not positively or sensibly injurious, by diminishing the value of the common

right, is an implied element in the right of using the stream at all."

So also in *Palmer Water Co.* v. *Lehighton Water Co.*, 280 Pa. St. 492 the court says:

> "Every riparian owner is entitled to use so much of a stream running by or through his lands as may be necessary for domestic needs or other similar purposes. The use for extraordinary purposes must be such as will not sensibly or materially diminish the quantity."

The following is a recent statement of the rule in 27 *Ruling Case Law* under the title "Waters", Sec. 31:

> "31. *Limitations on Right.* The general rule that a lower owner is entitled to the natural flow of a stream, if strictly construed and applied, would be too broad, for it would give the lower proprietor superior advantages over the upper, and in many cases give him in effect a monopoly of the stream, and it is accordingly uniformly held that the right of a riparian owner to the natural flow of the stream is not an absolute right to the flow of all the water in its natural state, but is subject to the right of the upper owners to make a reasonable use of such waters. *The law does not require that there shall be no diminution,* obstruction, or detention whatever by the riparian proprietor, but on the contrary there may be a diminution in quantity or a retardation or acceleration of the natural flow, indispensable for the general and valuable use of the water, perfectly consistent with the existence of the common right. *The diminution, retardation or acceleration not positively and sensibly injurious by diminishing the value of the common right is implied in the right of using the stream.*"

While the City of New York is not a riparian owner on the Delaware and its tributaries, yet since it has been authorized by the State of New York to take water from the tributaries of the Delaware, its action in that respect is therefore lawful so far as the State of New York is concerned, and I think that even under the common law the principle to be applied is whether the taking by New York

City will be so great as to be positively or sensibly injurious to New Jersey. We have here a stream in which the states of New York, New Jersey and Pennsylvania have a common interest. The Delaware River throughout its course "is but a single stream wherein each state has an interest which should be respected by the other" (*Wyoming* v. *Colorado*, 259 U. S. 419). *No one state should have a monopoly of the stream.* New York should not be allowed to divert all or such portion of the waters of the stream as seriously to injure New Jersey; nor should New Jersey be allowed to require that all the water of the Delaware originating in New York State shall flow into New Jersey totally undiminished.

In the final analysis I think some taking by New York should be permitted. I do not think it matters to New Jersey whether that taking is by a riparian owner or not. The State of New York which "has full jurisdiction over the lands within its borders including the beds of streams and other waters" (*Kansas* v. *Colorado* 206 U. S. 93) has given authority to New York City to take waters from the New York tributaries of the Delaware.

While I find no decision of this court directly and absolutely controlling in the present controversy, yet I am of the opinion that the principles decided by this court in the cases above mentioned sustain the view that New York City is entitled to divert a reasonable quantity of water from the tributaries of the Delaware. The common law itself is not static but grows and expands to meet new conditions of society as they arise, and the same is true as to interstate common law.

Bearing in mind that the common law permits a reasonable diminution in the flow of a stream by an upper proprietor; that all three states have permitted diversions (in some instances from one watershed to another) for canal and other purposes; that this court in controversies between states applies "federal law, state law and international law *as the exigencies of the particular case may de-*

mand"; that interstate common law, as far as developed by this court permits reasonable diversions and even from one watershed to another in some instances, I am brought to the conclusion that the only decision, consonant with right and justice, is to hold that a reasonable diversion by New York City should not be enjoined and that the doctrine of equitable apportionment of the waters of an interstate stream is a sound principle of interstate common law.

Other Applicable Principles.

I should state here also that in the examination of the proof I shall apply the principles announced by this court in controversies between states relative to the granting of injunctions and relative to the weighing of evidence. In *Missouri* v. *Illinois*, 200 U. S. 496, which was a suit by Missouri to enjoin Illinois and the Sanitary District of Chicago from discharging sewage into the Mississippi River, this court said:

> "Before this court ought to intervene, the case should be of *serious magnitude, clearly and fully proved,* and the principle to be applied should be one which the court is prepared deliberately to maintain against all considerations on the other side. See Kansas *v.* Colorado, 185 U. S. 125, 46 L. ed. 838, 22 Sup. Ct. Rep. 552."

In the case of *New York* v. *New Jersey*, 256 U. S. 296, which was a suit brought by the State of New York to enjoin the State of New Jersey from discharging sewage into New York harbor, this court said:

> "With the record in this state we come to consider the evidence introduced, but subject to the rule that the burden upon the state of New York of sustaining the allegations of its bill is *much greater than that imposed upon a complainant in an ordinary suit between private parties.* Before this court can be moved to exercise its extraordinary power under the Constitution to control the conduct of one state at the suit of another, the threatened invasion of rights must be of serious magnitude, and it must be established by clear and convincing evidence."

I should add also that the purpose of the proposed diversion has a bearing in this connection and that is that the diversion is for the purpose of furnishing to the City of New York one of the great necessaries of life—pure and wholesome water. The diversion is for what was termed in *Wisconsin* v. *Illinois* "domestic pumpage", and is not for the purpose of flushing sewage from a river. In short the diversion is for a reasonable purpose and, indeed, a high public purpose.

As said by the court in *Columbus* v. *Mercantile Trust & D. Co.*, 218 U. S. 658, "no higher police duty rests upon municipal authority than that of furnishing an ample supply of pure and wholesome water for public and domestic uses".

Nor is the proposed diversion one suddenly and arbitrarily attempted. New York attempted to negotiate a compact with New Jersey and Pennsylvania relative to the conservation and use of the waters of the Delaware and its tributaries, and this compact, though signed by the commissioners of all three states, was ratified by the legislature of New York only. It was not ratified by New Jersey and Pennsylvania. New York then attempted to negotiate a new compact and this second compact, though signed by the commissioners of all three states, was again ratified by New York only. It was not ratified by New Jersey and Pennsylvania. This second compact of 1927 provided for the diversion by New York of the equivalent of 600 million gallons daily and with the released flows as set out in the New York plan. While these compacts, as they were not ratified by New Jersey, do not at all estop New Jersey from maintaining this suit, yet they are admissible in evidence for the purpose of showing the history of this whole matter and for the purpose of showing that New York has not formulated an arbitrary plan of diversion, entirely of its own making, but on the contrary has adopted a plan unanimously agreed to and approved by the commissioners of the three states, though ratified by the Legislature of New York only.

I should also refer to another principle of law which I have applied in this case. This has reference to determining conflicts of evidence, particularly conflicts of evidence between experts of high standing, on the effect of the proposed New York diversion. The principle to which I refer is thus stated in *North Dakota* v. *Minnesota*, 263 U. S. 385:

> "It is difficult for a court to decide issues of fact upon which experts equal in number and standing differ flatly, and when their conclusions rest on estimates upon the correctness of which the court, without technical knowledge, cannot undertake to pass. *In such cases, the court looks about for outstanding facts from which the lay mind can safely draw inferences as to the probabilities.* The court is also aided by its judgment of the care and accuracy with which the contrasted experts respectively have determined the data upon which they base their conclusions."

VI.

NECESSITY FOR THE DIVERSION.

In the bill of complaint it is alleged that there is no public necessity for the proposed diversion of waters from the tributaries of the Delaware River to the water supply system of New York City. The bill also alleges that there is a wasteful use by the City of New York of its existing supply of water. It is alleged that although the metering of water has been repeatedly recommended, yet said City has refused to establish any universal system of metering and that this results in a wasteful use of water, and it is insisted that the City of New York should be required to conserve its water supply by metering before it should be allowed to resort to the waters of the tributaries of the Delaware River.

In the answer of the City of New York it is stated that there have been agitations from time to time relative to establishing a system of universal metering but that no action has been taken in that direction for the reason that

the installation of meters would effect no material saving in the quantity of water consumed and would result in a substantial increase of cost of water delivery.

The bill also alleges that the City has not changed its water rates since 1856, notwithstanding the increased cost of construction, operation and maintenance of water supply since that time. Nevertheless the bill alleges said City operates its water system at a profit, to-wit, a profit of more than $800,000.00 in 1925 and more than a million dollars in 1926.

New York City admits that it has not changed its water rates since 1856 and substantially admits the profits on the water system as alleged in the bill.

The bill also alleges that it is unnecessary for the City to resort to the tributaries of the Delaware River for an accession to its water supply, as the City has investigated and found available additional sources of water supply (other than the Delaware River tributaries) in certain streams in New York and that the taking from these streams will not affect injuriously the interests of any other state. These additional sources of water supply consist of the Hudson River and certain streams in the Hudson watershed and the ground waters of Suffolk County on Long Island.

The substance of this portion of the bill is that before the City should be allowed to divert water from the Delaware watershed to the Hudson watershed (it being claimed that said diversion will be injurious to the State of New Jersey), the City of New York should exhaust the sources of water supply in the Hudson watershed and on Long Island, as the taking of waters from the Hudson watershed and from the Hudson River itself and from Long Island sources will not affect any other state.

It is also claimed, as stated, that before the City should be allowed to resort to the Delaware River tributaries as a source of water supply, the City should first be required to conserve its present water supply by adopting a system of

universal meterage and by the charging of adequate rates for water.

On the argument of this cause before me I suggested that this question of necessity might, perhaps, be more appropriately termed a marshaling of water resources by the defendant State and City. In other words, the insistence is that the City has two general sources of additional water supply, first, sources the taking from which will not affect another state; second, sources (tributaries of the Delaware River) the taking from which will injuriously affect another state.

The principle contended for is somewhat analogous to the general equity principle of the marshaling of assets, as, for instance, requiring a creditor who has a lien on two funds to exhaust first that fund on which he alone has a lien before he resorts to another fund upon which other creditors also have liens.

The principle contended for does not seem to me to be entirely without application, but in my opinion its application should be limited to a case where it is clearly shown that the defendant City and State are wilfully, arbitrarily, or without any substantial or sound reason, resorting to the tributaries of the Delaware River instead of resorting to other sources of water in the Hudson River watershed. I think that it is a matter of the internal administration of their own affairs for the State and City of New York to select the sources in New York from which New York City should obtain its water supply, and that the State of New Jersey has no right to intervene in this matter of the administration of the internal affairs of the State and City of New York, unless it should clearly appear, as already stated, that the taking of waters from the tributaries of the Delaware River is entirely a wilful act or a totally reckless one, or one without any conceivably sound basis. Likewise, it seems to me that it is a matter entirely for the determination of the City of New York as to what rates shall be charged for the delivery of water to consumers thereof and also whether the best interests of the City and

its water consumers are conserved by a system of universal metering or by some other system. It is the opinion of the present Chief Engineer of the Board of Water Supply of the City of New York that universal metering is not advisable. At present the metering in New York City is to the extent of about twenty-three per cent. It is also the opinion of the said Chief Engineer that the expense of installing a system of universal metering in New York City would be extremely expensive and would not justify the cost and that it would not result in any material saving of water. From my examination of the evidence, I am of the opinion that the per capita use of water in New York City is not grossly excessive. Many tables of comparison of per capita use of water in cities of the United States have been presented, but these comparisons are not altogether helpful on account of different circumstances and conditions in various cities. The per capita consumption of water in cities will necessarily vary with the extent to which the city is residential or industrial, and the exact basic facts, as to the extent that various cities are residential or industrial, do not appear. Undoubtedly New York City has an extremely large transient population and also a large daily population of commuters from nearby points in New York and other states, which adds to the per capita consumption of water in New York City as compared with other cities.

The evidence is conflicting as to the extent to which universal metering in New York City would effect a saving in water consumed. At various times in the past thirty years reports have been made to the City recommending meterage and stating various percentages in the saving of water.

Major Whitman, a qualified witness for New Jersey, estimated that if the City were wholly metered, the time when an additional supply would be needed would be deferred five years.

Undoubtedly universal metering would make a substantial saving, as consumers undoubtedly would be more care-

ful in the use of water. I think that is an outstanding and self-evident fact. However, adopting Major Whitman's estimate as correct, it would not postpone the need of an additional supply of water beyond 1940, and as it appears from the evidence that it will take eight and perhaps ten years to complete even the first stage of the New York plan, it is clear that the City of New York is not acting prematurely in attempting to arrange for an additional supply of water. Mr. Merriman, the Chief Engineer of the Board of Water Supply of New York City, estimates that with the normal increase in population, the demand will be in excess of the supply by 1935 and I have no hesitation in finding that the need of the City for obtaining an additional water supply is real and imperative and that the effort to obtain an additional supply should not be delayed.

It is also contended in the bill, and there is much proof to support this contention, that the City should exhaust its sources of water supply within the Hudson River watershed and on Long Island before resorting to the diversion of water from Delaware River, and there has been much proof on the part of the plaintiff and the defendants as to the relative cost of obtaining water from the Delaware River as compared to the cost of obtaining water from the Hudson River direct at or near Poughkeepsie, New York, or from what is called East Hudson Project No. 1, East Hudson Project No. 2, the Lower Schoharie watershed, or from the ground waters of Long Island.

The proof undoubtedly shows that the City of New York can obtain an additional water supply (equivalent in quantity to that which it proposes to take from the Delaware River tributaries), from tributaries of the Hudson River or from the Hudson River direct. In other words, it is undoubtedly possible for the City of New York to obtain the additional quantity of water which it desires without resorting to the Delaware River tributaries. I think, however, the proof equally clearly shows that the water ob-

tained from the Hudson River watershed would not be equally good in quality, and that the supply from the Delaware tributaries is much more desirable because it is furnished by gravity, whereas the supply from other sources (except East Hudson No. 1) requires pumping. I think the proof also fairly shows that the expense of obtaining water from the Delaware River watershed is less than the expense of obtaining an equal quantity of water from the other sources suggested by the plaintiff and that the state of New York and the City of New York have not selected the tributaries of the Delaware River arbitrarily and without reason. In fact before the City of New York was allowed by the State of New York to resort to the tributaries of the Delaware River, there was a hearing (in accordance with the New York statute) before the Water Power and Control Commission of the State of New York, and as a result of this hearing resort to the Delaware River was permitted.

Mr. Thaddeus Merriman, the Chief Engineer of the New York Board of Water Supply testified as follows:

> "Q. Have you examined the testimony and the exhibits that have been presented in this case with respect to (5177) sources of water supply other than that from the five tributaries of the Delaware River as embraced in the City's plan?
>
> "A. Yes, sir; I have carefully examined all of these matters.
>
> "Q. Of all the sources of water supply for the City of New York that have been referred to in this case, which do you consider to be the best and most suitable?
>
> "A. I consider that which is embraced in the plan of the City of New York covering the five watersheds on the upper watershed of the Delaware River to be the best and the most suitable.
>
> "Q. Give your reasons for that conclusion.
>
> "A. My reasons for considering the Delaware as the best supply are:
>
> "First, that it will furnish a better quality of water than any of the others that have been mentioned. The water from the Delaware area is softer than that of

any of the other sources, and softness is a desirable quality. The softness and quality of the water which the proposed plan will furnish is the same as that from the present Catskill sources.

"Second, under the Delaware plan, the water will be delivered into the city by gravity and no pumping will need to be done. This plan, therefore, as compared with (5178) the suggested plans from the Hudson River and from the so-called East Hudson No. 2, will not involve the expenditure of money in perpetuity for raising the water up to such levels that it may flow to the city. In the case of a gravity flow system, after the bonds have been retired, the interest and amortization charges stop, while in the case of a pumping system the pumping charges go on forever and coal or its equivalent in energy must be burned and expended just as long as the system operates. It is clear from the viewpoint of the conservation of the natural resources that wherever a gravity water supply can be had that it should be secured, unless the first cost is prohibitive.

"Third, the water from the Delaware area under the proposed plan will, for many years, continue to be of better sanitary quality than that of the other sources suggested, because of the remoteness of the district and the general character of the mountainous land which is not susceptible of development. As compared with the east side sources that have been suggested, the likelihood of future development on the Delaware is far less. Even at the present time a parkway from the park system of Westchester County north of Troy and connecting with the Tri-State Taconic Park is being developed. This parkway will pass close to and through the east side watershed (5179) and will thus attract population and bring about the development of the area with the attendant possibility and danger of pollution.

"Fourth, the City of New York is the metropolitan center of the United States. To it people come from every part of the Union. The great permanent population, which the preliminary figures of the current census indicate as 6,600,000, and all these visitors, should be entitled to the best water supply that can be had.

"These are the reasons why I, as the engineer responsible for the recommendation of the Delaware plan, consider it as the best and most suitable."

On the same subject Mr. John R. Freeman, an outstanding and veteran hydraulic and water supply engineer, testified as follows: (p. 4109-10.)

"Q. Taking into consideration all the matters set forth in the testimony, and your own experience and knowledge of the New York situation, what is the best source of water supply for the City of New York?

"A. The headwaters of the Delaware River, rising in the Catskill Mountain region.

"Q. Tell us how you arrived at that conclusion.

"A. After many years of study, and studying various other possibilities, it is a watershed of very copious yield. The rainfall is heavy, particularly heavy on the southwesterly slope, and it is in a high altitude. The region is very sparsely settled and probably always will be (4110) sparsely settled, because it is not well adapted to agriculture. So the purity seems safeguarded by Nature better than any other available supply, and, because of its high altitude, it can be brought to the city by gravity and without the expense of pumping and without the danger of interruption which comes from pumping, if you happened to have the coal supply cut short by any means.

Prof. William H. Burr, another distinguished engineer, testified relative to the Delaware River tributaries: (p. 5252-3.)

"All these streams, including the Rondout, yield water of high excellence and their sparsely-settled drainage areas confribute both to an economical sanitary administration and the necessary policing of the district. These conditions can be much more economically realized in the Delaware River tributary drainage areas than in any of the districts which have been seriously considered on the east side of the Hudson River, where the population is greater than in the six drainage (5253) areas to the west of the Hudson River.

"The estimates of cost show that a complete initial construction of all the required works on the westerly side of the Hudson is materially less than for the corresponding construction on the east side of the Hudson where the quality of water is less excellent and where the maintenance would be more expensive and difficult.

"These conditions show that the yield of all the contemplated sources on the west side of the Hudson has marked advantages as to quality of water, economy of construction, freedom from the necessity of filters and pumping, economy in operation, police administration and maintenance."

Similar evidence was given by other hydraulic and sanitary engineers. On the other hand evidence was given by distinguished engineers for the State of New Jersey among others, Mr. Gustav J. Requardt, Major Ezra B. Whitman, Mr. L. M. Pearse, Prof. A. K. Barrows, Mr. Leroy Sherman, Mr. Robert E. Horton and others, showing that New York could obtain a satisfactory water supply from the Hudson River itself or from tributaries of the Hudson River, or from Long Island, and at a cost not greatly exceeding or even less than the cost of the Delaware River supply. Of course, the matter of cost is one of estimate and necessarily there was to be expected a difference in the range of figures. The comparison of cost between obtaining water from the Delaware River tributaries as against the cost of obtaining water from the Hudson River, or from Hudson River tributaries, or from Long Island does not seem to me to be of particular importance. I think it may be rightly assumed that the City of New York is not intentionally embarking upon a plan for the purpose of spending money wastefully. In other words, I think it may be fairly assumed that the City of New York considers the Delaware source of supply the most economic, but, whatever the cost may be, whether greater from one source or from another, the controlling consideration, in my mind, is that a purer and better water is obtained from the Delaware tributaries than from any other source. Another controlling consideration with me is that the Delaware River water will be delivered by gravity, and gravity works all the time, whereas, in the pumping of water there is the factor of human fallibility and human negligence and the lack of foresight. Certainly millions of people should have their water supply safeguarded in every possible way. Furthermore the waters

obtained from the sources suggested by New Jersey would not only require pumping but more filtration and purification generally, though undoubtedly such waters can be made acceptable and suitable for municipal water supply by proper treatment.

I think New York may rightfully insist that it is entitled to the best water and the most constantly reliable supply of water, even though the cost should turn out to be greater. I am, therefore, of the opinion that no useful purpose would be served by reviewing the great mass of evidence touching the relative cost of procuring water from the Delaware River tributaries and from the other sources suggested by the plaintiff. Neither do I think it affects the case that New York City at previous times had considered and recommended obtaining water from some of the sources suggested by New Jersey. It should be said in this connection that New York always realized that the obtaining of water from the Delaware tributaries involved negotiations with other states, or litigation with other states and, indeed, to avoid litigation and to come to an amicable settlement, New York attempted to negotiate compacts with New Jersey and Pennsylvania.

I do not disparage or discredit in the slightest the distinguished engineers who testified on behalf of New Jersey as to the feasibility of obtaining water without resorting to the Delaware tributaries or as to the feasibility of filtering or otherwise treating this water so as to make it acceptable as water for domestic and municipal use. I am of the opinion, however, that New York has the right to resort to the source of supply of its own selection in order to obtain the purest water and the best water, the supply of which is furnished by gravity rather than by human agency, provided, the obtaining of water from the Delaware sources does not unreasonably affect the State of New Jersey and its people. There was much evidence as to the desirability of obtaining pure water in the first instance rather than of obtaining water not so pure and thereafter purifying it.

I think, undoubtedly, it is a sound principle that the purest natural water should be obtained rather than relying upon filtration, chlorination or other means of purification to furnish equally good water.

As illustrating the differences in cost of obtaining an additional water supply for the City of New York, I will, however, call attention to one or two instances. Among the other sources of supply suggested for the City of New York is what is known as East Hudson Plan No. 1. This is a gravity supply and does not involve pumping. East Hudson Plan No. 1 contemplates the taking of water from certain eastern tributaries of the Hudson River. According to the evidence on behalf of the City of New York (Exhibit 244), this supply will yield 434 million gallons daily and New York City estimates the cost of this supply at $347,934,000.00. The plan contemplates the development of the following streams: Fishkill Creek and tributaries, Wappinger Creek and tributaries, Roeliff Jansen Kill, Tagkanic Creek, Claverack Creek and Kinderhook Creek and tributaries and perhaps other creeks. The streams to be developed lie north of the Croton watershed. A development of substantially the same streams is proposed by New Jersey so as to yield 450 million gallons of water daily at a total cost of $214,682,398.00. The wide difference in these estimates is immediately apparent.

On the other hand, the development of the Delaware River tributaries through the second stage (embracing Neversink River and the East Branch of the Delaware) and also including Rondout Creek, which is a tributary of the Hudson River, so as to yield 510 to 540 million gallons daily, shows an estimated cost by New York of $209,909,000.00 (See Exhibit 4). The expert witnesses for New Jersey criticise the expense of New York's East Hudson plan (Exhibit 244), as showing excessive costs, and, on the other hand, the New York engineers criticise the New Jersey East Hudson Plan No. 1 as giving entirely too low an estimate of cost and also too high a yield of water. The Chief Engineer of the New

York Board of Water Supply also criticises the structures as designed by New Jersey as being of such character as would not be permitted by the City of New York.

On consideration of all the evidence, I am of the opinion that it fairly appears, after hearing the evidence of expert engineers and their criticisms of the plans and figures of each other, that the development of the Delaware River tributaries through the second stage (which includes Rondout Creek, a tributary of the Hudson River) is the least expensive plan for obtaining an additional and adequate water supply for the City of New York.

I might go further and in great detail set out the conflicting evidence and the estimates of cost of obtaining water for New York City from sources other than the Delaware watershed and also set out the details of the estimates of costs of what is known as East Hudson Project No. 2, the cost of obtaining water from the Hudson River near Poughkeepsie, the cost of obtaining water from the Schoharie watershed on the west side of the Hudson and the cost of obtaining water from Long Island, but for reasons, already stated, I do not think such evidence particularly material.

While I am of the opinion, as stated, that New York City has adopted the plan which is least expensive, yet, as already stated, I do not deem that consideration controlling. I repeat that it clearly appears that the best and purest water for the municipal water supply of New York City is the water from the Delaware River tributaries. I think in a matter involving the health and welfare of a city of nearly seven million people, that source of supply may properly be selected which furnishes the purest and best water, even though it may involve an additional cost over obtaining water in the Hudson watershed or from Long Island—though, as already stated, I think the evidence fails to show that the expense of obtaining water from the Hudson watershed or from Long Island will be less than obtaining water from the Delaware tributaries. The action of the

City of New York in selecting as its source of additional water supply Rondout Creek and the tributaries of the Delaware River is found by me not to be an arbitrary one but one taken after prolonged and careful investigation. This determination was made by the City through its experts and was afterwards confirmed, after a hearing, by the Water Power and Control Commission of the State. The judgment of the City and the State as to this source of water supply should not be lightly set aside or overruled —and as I find that the selection of Rondout Creek and the Delaware tributaries as a source of water supply for the City of New York was not made arbitrarily but is founded upon sound and substantial reasons, I am unwilling to recommend the granting of an injunction as prayed for by the plaintiff merely on the ground that there are other sources of water supply for the City of New York, the taking from which will not be of interest to or affect other states.

I may add that it appears that there is an almost unlimited source of supply for New York City by taking from the Hudson River near Poughkeepsie. The taking of water from the Hudson River means the taking of an unsatisfactory water in the first instance, water which is considerably polluted and which will require very considerable purification before becoming acceptable as a municipal water supply, and the taking of this water will also require expensive pumping for all time to come. I may also add that the Delaware River tributaries have been considered for many years by New York City as a source of supply, but the resort to the tributaries of the Delaware River has been postponed by reason of the apprehension of interstate complications and by delay resulting during the negotiations of the proposed compacts of 1925 and 1927. The right, however, of New York City to resort to the Delaware River tributaries is not precluded by the mere fact of threatened litigation or embarrassing complications with other states. The whole question is, have the State of New York and the

City of New York the right to make use of the tributaries of the Delaware River as a source of water supply for the City of New York? My conclusion is that they are not precluded from so doing merely for the reason that there are other sources of supply in the State of New York, the taking from which would not affect other states.

It remains then to ascertain from the evidence whether the proposed diversion will injuriously affect New Jersey to the extent that it is entitled to an injunction.

VII.

GENERAL EFFECT OF NEW YORK DIVERSION ON FLOW AND LEVEL OF DELAWARE RIVER.

The Delaware River rises in the western slopes of the Catskill mountains in the State of New York. There are two branches of the river, one known as the West Branch and one known as the East Branch. These branches unite at Hancock, New York, and form the Delaware River proper. From Hancock the river flows in a southeasterly direction for a distance of approximately 75 miles to Tri State Rock where it enters the State of New Jersey. From parallel of latitude 42° (north), a few miles above Hancock, the West Branch of the Delaware River and the Dela- River are the boundary between Pennsylvania and New York to Tri State Rock. Port Jervis, New York is about one mile above Tri State Rock. From Tri State Rock the river flows in a southerly direction to the head of tide water at Trenton, New Jersey, the distance being about 120 miles. From Trenton the river flows in a southerly direction as a tidal stream to Delaware Bay. The distance from Trenton to Delaware Bay is about 92 miles. The distance from Hancock to the mouth of the river in Delaware Bay is, therefore, approximately 287 miles (Exhibits 88, 110 and 207).

From Downsville, New York (the location of the largest of the New York dams) to Trenton is approximately 227 miles.

The river is the boundary between New Jersey and Pennsylvania from Tri State Rock to the Delaware-Pennsylvania State Line near Chester, Pennsylvania. It is a large stream and one of the principal rivers of the Atlantic seaboard. At Port Jervis the width of the river is 650 feet at low water and 675 feet at bank-full stage. At Phillipsburg, New Jersey the width of the river is 400 feet at low water and 500 feet at bank-full stage. At Trenton the width of the river is 1246 feet at low water and 1270 feet at bank-full stage (Exhibit 110). The river has high banks and rarely gets out of its banks. It is usually clear and consists of a continued succession of pools and rapids, rendering modern navigation between Hancock and Trenton impossible. It is a very beautiful stream and flows through a country of rare scenic beauty.

South of Hancock the river has a number of tributaries; the principal tributaries in New York are the East and West Branch which unite at Hancock, the Mongaup River and Neversink River. The principal Pennsylvania tributaries are the Lackawaxen River, Lehigh River and Schuylkill River. The principal New Jersey tributaries are Paulins Kill, Pequest River and Musconetcong River.

The decided slope of the river is indicated by the fact that the zero point on the gauge at Port Jervis is 414.9 feet above mean sea level, zero point at Phillipsburg is 155.4 feet above mean sea level and zero point at Trenton is 7.5 feet above mean sea level (Exhibit 110).

The proposed New York diversion is 219 billion gallons per annum (600 million gallons additional in Leap years), which is the equivalent of a diversion of 600 million gallons daily or, expressed in cubic feet, a diversion at the rate of 928 cubic feet per second. The release under the New York plan of .45 cubic feet per second per square mile of diversion area (diversion area 610 square miles) is equivalent, expressed in cubic feet, to a released flow of 275 cubic feet per second. This release of 275 cubic feet per second is to be made during every day of July, August, September and

October and on such other days during the remaining eight months in the year when the water yield or runoff of the catchment or diversion area is less than .45 c. s. m. (275 c. f. s.).* The released flow during July, August, September and October of 275 c. f. s. is arbitrary and regardless of the water yield of the diversion area.

It may be that on some days of said four months the water yield of the diversion area is in excess of 275 c. f. s. and, in that event, the excess above 275 c. f. s. would be stored and the arbitrary 275 c. f. s. released. On other days of the same months the water yield or runoff of the diversion area may be less than .45 c. s. m. and in that event sufficient water is released which, added to the natural water yield, will bring the total flow below the dams to 275 c. f. s. So also on the so-called dry days of the remaining eight months (that is, when the water yield of the diversion area is less than .45 c. s. m.), sufficient water will be released which, added to the natural water runoff or yield of the diversion area, will bring the amount of the release to 275 c. f. s.

All that the New York plan of release guarantees is that there will be a total flow of 275 c. f. s. during every day of July, August, September and October immediately below the point of storage, and that there will be a similar flow of 275 c. f. s. below the point of storage on every day during the remaining eight months when the water yield of the diversion area is less than 275 c. f. s. The New York plan of release does not guarantee the maintenance of the Delaware River at any particular stage.

There was a vast volume of evidence accompanied by numerous exhibits as to the effect of the proposed New York diversion on the Delaware River. In determining this effect the parties necessarily resorted in the main to the same basic data. The most reliable information obtainable consisted of the stream flow records of the gauging stations of the United States Geological Survey and some state records.

*For convenience, the abbreviation c. f. s. will be used for cubic feet per second, and c. s. m. for cubic feet per second per square mile.

I set out in the appendix "A" hereto (from Exhibits 15 and 16) the monthly discharge of the Delaware River for a period of years at Port Jervis and Trenton.

In determining what the effect of the New York diversion would be in the future, the parties attempted to show what the probable effect of the New York diversion would have been if it had existed in the past. The stream flow records of the Delaware River do not exist for any long period of time. It would have been much more satisfactory if complete stream flow records had been available for a number of points on the Delaware River for a period, say, of fifty years. The longest period for which stream flow records are available is at Port Jervis where records have been kept from the latter part of 1904 to date. Even in this record there are some breaks due to the inability definitely to determine stream flow at times of ice jams in the river. However, estimates have been made for such periods. The stream flow record at Trenton exists only from the early part of 1913 to date. The stream flow record at Belvidere is from the early part of 1922 to date. The record at Riegelsville is from the middle of 1906 to date (Horton's Exhibit 57). There is no gauging station at Tri State Rock and hence it was necessary to estimate the stream flow of the Neversink River and add this estimate to the stream flow records of Port Jervis. Some difference in the estimates of the parties as to the effect of the New York diversion on the Delaware River is due to the different periods of time covered by the estimates and some difference is due to the different methods employed by the parties in arriving at their results. In the upper section of the river, New Jersey shows the effect at Tri State Rock (above which there are all of the 610 square miles of the New York diversion area), whereas New York shows the effect at Port Jervis above which there are only 540 square miles of the diversion area. The difference is accounted for by the 70 square miles of diversion area on the Neversink and, as there are no complete stream flow records for the Neversink River, New Jersey made an estimate for that river.

In comparing these estimates of the parties it is to be borne in mind therefore that the New York estimates are based upon the records at Port Jervis above which there is a total drainage area of 3070 square miles and a diversion area of 540 square miles, whereas the New Jersey estimates are based upon Tri State Rock above which there is a total drainage area of 3415 square miles, and a diversion area of 610 square miles. The diversion area is only that part of the drainage area above the dams.

Passing farther down the river to Belvidere, Riegelsville and Trenton, the estimates of New Jersey are based upon the records for the years for which records exist, whereas the New York estimates are based upon existing records and, in addition, estimates for previous years.

The drainage area above Port Jervis is 3070 square miles, above Tri State Rock 3415 square miles, above Belvidere, New Jersey, 4540 square miles, above Riegelsville, 6190 square miles, above Trenton 6800 square miles, above Delaware State Line, 10,444 square miles, above Arnold's Point at the upper end of the natural oyster beds, 11,420 square miles, above Deep Water Point, Delaware, 12,027 square miles, and above Capes May and Henlopen, 13,660 square miles.

Of the 3415 square miles of drainage area above Tri-State Rock (which is at the point where the Delaware enters New Jersey) there are 2389 square miles in New York, 1016 square miles in Pennsylvania and 10 square miles in New Jersey. New York City proposes to develop 610 square miles on tributaries of the Delaware,—all 610 square miles being within the State of New York. The 610 square miles thus proposed to be developed are about 25.5% of the whole Delaware River drainage area within the State of New York; about 17.8% of the drainage area of the Delaware River above Tri-State Rock; and about 8.9% of the drainage area above Trenton, about 5.3% of the drainage area above Arnold's Point, and about 4.5% of the drainage area above Capes May and Henlopen.

The water yield of the 610 square miles of diversion area is approximately 2.2 cubic feet per second per square mile.

In addition to stating the effect of the New York diversion at Port Jervis and Tri State Rock, the evidence also included the effect at Belvidere, Riegelsville and Trenton and other points.

As to the effect on the level of the Delaware River, Prof. H. K. Barrows of the Massachusetts Institute of Technology, a distinguished engineer and author, filed Exhibit No. 103, in which he divides the year into two parts, May to October inclusive (called the summer period) and November to April, inclusive (called the winter period.) This exhibit covers the years 1914 to 1927, both inclusive. He estimates that at Tri State Rock the net average decrease in the level of the Delaware River during the summer period of the 14 years mentioned would be 1⅞ inches and during the winter period 3⅝ inches. At Trenton he estimates the net average decrease in the summer at 1½ inches and the net average decrease in winter at 2⅜ inches. I reproduce in part Exhibit 103:

Plaintiff's Exhibit No. 108

N. J. vs. N. Y.

EFFECT OF DIVERSION ON MONTHLY STAGE OF DELAWARE RIVER

H. K. BARROWS
6 BEACON ST., BOSTON

May 1914–April 1927, except as noted

Diversion	Point of Effect	Average Effect on Monthly Stage						Greatest (3) Monthly Decrease in Stage		Greatest (3) Monthly Increase in Stage	
		Summer May-Oct.		Winter Nov.-Apr.		Year					
		Ft.	Ins.	Ft.	Ins.	Ft.	Ins.	Ft.	Ins.	Ft.	Ins.
600 M. G. D.	A. TRI STATE ROCK							.70	8 3/8	.10	1 1/4
								.70	8 3/8	.06	3/4
								.70	8 3/8	.05	5/8
	Decrease	.16	1 7/8	.30	3 5/8	.23	3/4				
	Increase	0	0	0	0	0	0				
	Net Decrease	.16	1 7/8	.30	3 5/8	.23	2 3/4				
	B. BELVIDERE (1923–27)							.65	7 7/8	.09	1 1/8
								.61	7 3/8	.09	1 1/8
								.57	6 7/8	.08	1
	Decrease	.20	2 3/8	.34	4 1/8	.27	3 1/4				
	Increase	.01	1/8	0	0	.01	1/8				
	Net Decrease	.19	2 1/4	.34	4 1/8	.26	3 1/8				
	C. RIEGELSVILLE							.80	9 5/8	.10	1 1/4
								.75	9	.10	1 1/4
								.70	8 3/8	.10	1 1/4
	Decrease	.19	1 1/4	.34	4 1/8	.27	3 1/4				
	Increase	.01	1/8	0	0	.01	1/8				
	Net Decrease	.18	1 1/8	.34	4 1/8	.26	3 1/8				
	D. TRENTON							.48	5 3/4	.07	7/8
								.43	5 1/8	.06	3/4
								.40	4 3/4	.06	3/4
	Decrease	.12	1 1/2	.20	2 3/8	.16	1 7/8				
	Increase	0	0	0	0	0	0				
	Net Decrease	.12	1 1/2	.26	2 3/8	.16	1 7/8				

I also reproduce here Professor Barrows' Exhibit 240, showing the average monthly effect on stage and discharge of Delaware River under the New York plan of diversion. This exhibit is confined to the months of July, August, September and October, and for the years indicated thereon.

AVERAGE MONTHLY EFFECT ON STAGE AND DISCHARGE OF DELAWARE RIVER BY NEW YORK CITY PLAN OF DIVERSION

Average for Period Indicated.

	July	Aug.	Sept.	Oct.	Average July-Oct.
(1)	(2)	(3)	(4)	(5)	(6)
TRENTON (1913–1928)					
Av. monthly flow, c.f.s.					
Before diversion	7,250	5,910	4,680	6,580	6,105
After diversion	6,810	5,580	4,380	5,971	5,685
Av. change in flow					
c.f.s.	−440	−330	−290	−610	−420
m.g.d.	−284	−213	−187	−394	−271
percent	−6.1	−5.6	−6.2	−9.3	−6.8
Av. change in stage					
inches	−1⅜	−1	−1¼	−1⅝	−1¼
RIEGELSVILLE (1913–1928)					
Av. monthly flow, c.f.s.					
Before diversion	7,270	5,700	4,630	6,650	6,062
After diversion	6,830	5,370	4,340	6,040	5,645
Av. change in flow					
c.f.s.	−440	−330	−290	−610	−417
m.g.d.	−284	−213	−187	−394	−269
percent	−6.1	−5.8	−6.3	−9.2	−6.9
Av. change in stage					
inches	−2⅝	−1⅜	−1½	−2⅝	−1½
BELVIDERE (1923–1928)					
Av. monthly flow, c.f.s.					
Before diversion	4,943	4,590	4,503	7,266	5,326
After diversion	4,752	4,277	4,070	6,448	4,887
Av. change in flow					
c.f.s.	−191	−313	−433	−818	−439
m.g.d.	−123	−202	−279	−528	−283
percent	−3.9	−6.8	−9.6	−11.3	−8.3
Av. change in stage					
inches	−⅝	−1½	−2⅛	−3	−1⅞
TRI-STATE ROCK (1914–1927)					
Av. monthly flow, c.f.s.					
Before diversion	3,512	2,846	2,716	4,486	3,390
After diversion	3,066	2,516	2,409	3,822	2,953
Av. change in flow					
c.f.s.	−446	−330	−307	−664	−437
m.g.d.	−288	−213	−198	−428	−282
percent	−12.7	−11.6	−11.3	−14.8	−12.9
Av. change in stage					
inches	−1¼	−1¼	−1½	−2⅝	−2

In considering these exhibits it must be borne in mind that they are statements of averages. On particular days there were greater or less decreases in the level of the river than the average decrease and on other days there were in-

creases in the level. It should also be observed that the increase or decrease in the height of the river is dependent somewhat upon the width between the banks as, where the banks are far apart a given diversion or abstraction of water will show a less lowering of the river than would be shown where the banks are closer together.

I do not think, however, that the number of inches which the stream may be raised or lowered is of as much importance as the extent to which the stream flow may be decreased or increased. New York proposes to take 219 billion gallons a year (in Leap years 600 million gallons more), which is the equivalent of 600 million gallons a day or 928 c. f. s. This means, of course, that on some days there will be diverted much more than 600 million gallons and on other days much less than 600 million gallons, and on some days no diversion at all. The sum total at the end of the year, however, will be that the water diverted will amount to the equivalent of 600 million gallons a day.

The theory of the New York plan is that water will be diverted from the tributaries of the river at high or flood stages and that water will be released into the river from the impounding reservoirs at low stages of the river, and that the operation of the New York plan, instead of being hurtful to the river, will be helpful. It is the claim of New York that it takes flood and waste waters which run to the sea and help no one and in lieu thereof during periods of low flow, the New York plan adds needed water to the river.

New Jersey denies that any of the waters of the river are waste waters and insists that all the water of the river serves a beneficial use.

The evidence shows that the floods in the Delaware River are not of the same destructive type as floods in the Mississippi valley and elsewhere. In the Mississippi valley, for instance, the river at times spreads over vast areas of land, washes away houses, drowns cattle and, at times, there is considerable loss of human life. The floods in the Delaware

are of a different character and inflict no such destruction. In fact the damage occasioned by the Delaware floods seems to be rather inconsequential in character. Nevertheless, the Delaware River is subject to wide variations in flow and is described as a very flashy stream. According to the records of the United States Geological Survey the flow in the Delaware River at Port Jervis has varied from 92,700 c. f. s. too 175 c. f. s., and at Trenton the flow has varied from 160,000 c. f. s. to 1240 c. f. s. (Exhibit 15.)

The parties to this suit have with great industry and in great detail attempted to show the effect of the New York diversion, with water released according to the New York plan, and also released according to the Pennsylvania plan. Releases under the New York plan are based on the water yield of the 610 square miles of diversion area. Releases under the Pennsylvania plan are based upon the stage of the river at Port Jervis and at Trenton.

To repeat, under the New York plan there is a release from the impounding reservoirs of .45 c. s. m. (the equivalent of 275 c. f. s.) every day during July, August, September and October, and there is also a release of .45 c. s. m. on every day during the eight remaining months of the year—dry day meaning every day on which the water yield of the diversion area is less than .45 c. s. m.

Under the Pennsylvania plan of releases, water is released from the impounding reservoirs at any time that the flow in the Delaware River at Port Jervis or at Trenton falls below .50 c. s. m. As there are 3070 square miles of drainage area above Port Jervis, therefore .50 c. s. m. at Port Jervis means a flow of 1535 c. f. s., and as there are 6800 square miles of drainage area above Trenton, a flow of .50 c. s. m. at Trenton means a flow of 3400 c. f. s. In other words, whenever the flow of the river at Port Jervis is less than 1535 c. f. s. or the flow at Trenton is less than 3400 c. f. s., or both, then, under the Pennsylvania plan there is to be released from the impounding reservoirs sufficient water to restore the flow to .50 c. s. m., provided, however,

there is not required to be released at any time more than 30% of the average water yield of the diversion area. As the evidence shows the average run off from the diversion area is 2.2 c. s. m., it follows that 30% of this amount is .66 c. s. m., which is the equivalent (for 610 miles of diversion area) of 402.6 c. f. s., and that figure is the maximum release under the Pennsylvania plan.

Mr. Robert E. Horton, a prominent and experienced engineer, testified on behalf of the State of New Jersey and filed an exhibit (No. 74) showing the decrease and increase in the flow of the Delaware River if the New York plan had been in operation from September, 1913 to September, 1929 (both dates inclusive). This exhibit shows the increase or decrease for each day of that period and is too voluminous to be reproduced here. It should be noted that Mr. Horton considers the diversion area of New York to be 617 square miles, whereas it is stated by New York to be 610 square miles. This difference is not particularly material.

I can only state some of Mr. Horton's averages, though I do not think that averages present as accurate a picture as daily records. Giving the averages by months of 1929 Mr. Horton states that the flow of the river would have been decreased in January, 792 c. f. s.; February, 741 c. f. s.; March, 3365 c. f. s.; April, 4340 c. f. s.; May, 2133 c. f. s. and in June, 539 c. f. s., and that the flow would have been increased in July, 19 c. f. s.; August, 129 c. f. s. and September, 71 c. f. s.

For the year 1928 Mr. Horton states (on Exhibit 74) that under the operation of the New York plan the net average increase or decrease in the flow of the Delaware River for each month would have been as follows: January, decrease, 1110 c. f. s.; February, decrease, 1209 c. f. s.; March, decrease, 1335 c. f. s.; April, decrease, 2857 c. f. s.; May, decrease, 2491 c. f. s.; June, decrease, 2670 c. f. s.; July, decrease, 1433 c. f. s.; August, decrease, 750 c. f. s.; September, decrease, 371 c. f. s.; October, increase, 56 c. f. s.; November, decrease, 28 c. f. s.; December, decrease, 580 c. f. s.

Mr. Horton also summarizes his work by showing the

number of days on which the flow in the river would have been increased and the number of days the flow would have been decreased under the New York plan. This is Exhibit 77 and covers the calendar years 1915 to 1928, both inclusive. I extract from that exhibit the following:

"Days of Increased Flow and Decreased Flow.

Year	*Increase Days*	*Decrease Days*
1915	10	355
16	50	316
17	35	330
18	83	282
19	26	339
1920	50	316
21	52	313
22	82	283
23	93	272
24	109	257
1925	71	294
26	59	306
27	21	344
28	51	315
	792	4,322
Average	57	308"

Professor Barrows, on behalf of New Jersey, also filed diagrams or blue prints showing by monthly averages the effect of the operation of the New York plan on the Delaware River for the period beginning August 1, 1913, and ending September 30, 1928 (Exhibit 96).

Mr. Thaddeus Merriman, Chief Engineer of the Board of Water Supply of the City of New York and an engineer of marked ability filed voluminous exhibits, showing in colors the effect of the operation of the New York plan from January 1, 1905 to December 31, 1929, both dates inclusive. These diagrams, each consisting of 25 large pages, show the effect of the New York plan at Port Jervis and at Trenton (Exhibits 325 and 334, respectively). These exhibits were prepared in great detail and give visible pictures of what the effect of the New York plan would have been upon the

river for each day during the 25-year period mentioned, as estimated by the witness. I can only set out here some summaries.

So far as the showing at Port Jervis is concerned, it is to be borne in mind that the drainage area above Port Jervis does not include the drainage area of the Neversink River. The diversion area of the Neversink River is 70 square miles and, deducting that figure from the total of 610 square miles of diversion area, leaves 540 square miles. The showing made by Mr. Merriman as to the condition at Port Jervis, therefore, covers 540 square miles of the total of 610 square miles of the diversion area. In a volume (Exhibit 331) Mr. Merriman sets out for each day of the 25-year period mentioned the flow of the river at Port Jervis, and also he sets out his estimate of what would have been the modified flow of the river (that is, whether increase or decrease) for each day under the operation of the New York plan. This volume consists of 300 pages. Here too I can only present summaries or averages though, as said, summaries and averages do not present as accurate a picture as will appear from an examination of the daily recorded flow and the estimate of the daily modified flow under the New York plan. As somewhat illustrative, I will take the months of March and September 1929, the former being usually a wet month and the latter a dry month. Mr. Merriman's Exhibit (No. 331) shows that the average of the daily observed flows at Port Jervis for March, 1929 was 14,831 c. f. s. (the equivalent of 297,137 million gallons). He then shows that this average, under the operation of the New York plan, would have been 11,511 c. f. s. (the equivalent of 230,616 million gallons). For September, 1929, he shows that the average of the daily observed flows at Port Jervis was 1143 c. f. s. (the equivalent of 22,169 million gallons), whereas the average under the operation of the New York plan would have been 1184 c. f. s. (the equivalent of 22,946 million gallons). The summary by years is set out in Exhibit 333. That exhibit is reproduced here.

SUMMARY FOR ALL YEARS—1905 to 1929

Effect on flow of Delaware River at Port Jervis, N. Y. Gaging Station. (Area 3070 Sq. mi.). Under operation of plan of the city of New York (530 million gallons daily from 540 sq. mi.) (Does not include 70 sq. mi. on Neversink.)

Year	Flow into Reservoirs Million Gallons	Reserve Flow Released		Flow at Port Jervis Gage Million Gallons		Number of Days During Year That Flow Was			Yearly Draft To N.Y. City From 540 Sq. Mi. Million Gallons	After *Including Spillover*	Year
		Days	Million Gallons	Before	After *Not including Spillover*	Increased	Decreased	No change			
1	2	3	4	5	6	7	8	9	10	11	12
1905	257,387	169	26,538	1,239,675	1,008,826	79	286	..	193,450	1,046,225	1905
1906	280,447	123	19,315	1,348,502	1,087,370	21	344	..	193,450	1,155,052	1906
1907	287,205	123	19,315	1,377,090	1,109,200	56	309	..	193,450	1,183,640	1907
1908	248,356	140	21,984	1,189,916	963,544	125	241	..	193,980	995,936	1908
1909	279,161	181	28,423	1,326,241	1,075,533	174	189	2	193,450	1,132,791	1909
1910	220,918	156	24,498	1,062,574	866,154	146	219	..	193,450	869,124	1910
1911	261,075	126	19,786	1,258,137	1,016,848	64	301	..	193,450	1,064,687	1911
1912	280,016	134	21,042	1,334,847	1,075,873	82	284	..	193,980	1,140,867	1912
1913	291,475	129	20,257	1,255,051	982,849	105	259	1	193,450	1,061,601	1913
1914	258,788	193	30,307	1,168,128	939,096	151	206	8	193,450	974,678	1914
1915	304,915	132	20,728	1,314,627	1,030,763	9	356	..	193,450	1,121,177	1915
1916	290,397	124	19,472	1,523,095	1,251,524	46	319	1	193,980	1,329,115	1916
1917	306,763	135	21,199	1,428,937	1,143,251	31	334	..	193,450	1,235,487	1917
1918	227,496	151	23,713	1,139,654	936,497	93	272	..	193,450	946,204	1918
1919	277,793	126	19,786	1,193,516	935,044	16	349	..	193,450	1,000,066	1919
1920	385,275	165	25,911	1,781,763	1,372,732	42	324	..	193,980	1,537,783	1920
1921	276,806	144	22,613	1,237,691	983,166	53	312	..	193,450	1,044,241	1921
1922	244,869	166	26,068	1,190,543	971,672	75	290	..	193,450	997,093	1922
1923	237,483	129	20,257	1,195,162	978,220	93	272	..	193,450	1,001,712	1923
1924	258,287	165	25,911	1,262,603	1,030,570	101	258	7	193,980	1,068,623	1924
1925	257,260	154	24,183	1,267,952	1,034,855	60	305	..	193,450	1,074,502	1925
1926	249,996	125	19,629	1,277,094	1,046,836	63	302	..	193,450	1,083,644	1926
1927	385,765	123	19,315	1,997,286	1,631,053	30	335	..	193,450	1,803,836	1927
1928	289,312	145	22,770	1,585,512	1,317,850	51	314	1	193,980	1,391,532	1928
1929	296,600	125	19,629	1,381,233	1,104,602	80	284	1	193,450	1,187,783	1929
Aver.	278,154	143	22,506	1,331,473	1,075,757	74	290	1	193,577	1,137,896	Aver.

Total Number of Days ..... 9131 Days 100 % of Time
Reserve Flow Released ..... 3583 Days 39.2% of Time
Increased Flow in River ..... 1846 Days 20.2% of Time
Decreased Flow in River ..... 7264 Days 79.6% of Time
No Change ..... 21 Days 0.2% of Time

Mr. Charles E. Ryder, Chief Engineer and Secretary of the Water and Power Resources Board of the Commonwealth of Pennsylvania, with the aid of Mr. Arthur E. Morgan, both highly qualified engineers, prepared books of diagrams or blue prints showing the effect on the Delaware River of the taking of the equivalent of 600 million gallons of water daily by New York City, with the Pennsylvania plan of releasing water in operation instead of the New York plan of releasing. These diagrams of Mr. Ryder cover the following years: 1909, 1919, 1922, 1928 and 1929, —Mr. Ryder explaining that these years were taken as typical and that every year of the whole period of 25 years (1905-1929) was not taken on account of the immense labor involved in preparing these diagrams.

I can here also only refer to a few items of the basic data and must content myself with stating averages (Exhibit 418). For the month of March, 1929 the average observed flow at Port Jervis is the same as given by New York, to-wit: 14,831 c. f. s. Indeed, as the observed flow is taken from United States Geological Survey records, there is no occasion for any difference. Under the New York plan the average observed flow for March, 1929, was reduced to 11,511 c. f. s. The Pennsylvania plan shows the same reduction. However, for September, 1929 the average observed flow for September, 1929, was increased under the New York plan from 1143 to 1184 c. f. s., whereas, under the Pennsylvania plan the increase was to 1260 c. f. s.

It should also be stated in this connection that the New York and Pennsylvania engineers agreed as to the correctness of the data which the engineers of both states used. I reproduce here a summary prepared by Mr. Ryder showing a comparison of the New York plan of release and the Pennsylvania plan of releases for the year 1909, 1919, 1922, 1928 and 1929. (Ex. 419.)

SUMMARY—1909, 1919, 1922, 1928, 1929.

Effect on the flow of the Delaware River at Port Jervis of the development of 540 square miles in New York; comparing the New York Plan with the Pennsylvania Plan.

Year	Flow into reservoirs	Release		Observed flow at Port Jervis	Modified flow at Port Jervis	
		*N. Y. Plan	Penna. Plan		*N. Y. Plan	Penna. Plan
	(All flows expressed in billions of gallons.)					
1909.....	279.16	28.42	42.61	1,326.24	1,075.53	1,088.73
1919.....	277.79	19.79	16.60	1,193.52	935.04	931.39
1922.....	244.87	26.07	32.57	1,490.54	971.67	978.02
1928.....	289.31	22.77	10.05	1,585.51	1,317.85	1,305.01
1929.....	296.60	19.63	21.55	1,381.23	1,104.60	1,107.76

*NOTE.—Figures in this column are taken from Exhibit D-333.

Mr. Ryder also prepared a diagram (Exhibit 420), showing the daily effect on the Delaware River of the New York diversion at Trenton, New Jersey, with the Pennsylvania plan of release in operation, instead of the New York plan of release, during the years 1909, 1919, 1922, 1928 and 1929. He also prepared diagrams showing the effect on the Delaware River of New York taking 600 million gallons daily, Pennsylvania taking 750 million gallons daily and New Jersey taking 400 million gallons daily, though New York alone has a definite and authorized plan.

Mr. Ryder and Mr. Morgan stated their reasons in favor of the Pennsylvania plan of releasing water as being preferable to the New York plan. I am of the opinion that their reasons are sound. The New York plan of release is based upon the water yield of the diversion area only, without regard to the condition of the river between Port Jervis and Trenton. It is, however, the condition of the river between Port Jervis and Trenton in which New Jersey is interested, and not in the water yield of the diversion area. There may be a freshet or flood in the river at Port Jervis when no more water is needed, and yet under the New York plan, water would be released as an addition to this flood or freshet, provided the water yield in the New York diversion area is less than .45 c. s. m. There is also great difficulty in determining the exact water yield daily of the diversion area, whereas the stage of the river at Port Jervis and

Trenton is determined daily by the United States Geological survey. The theory of the Pennsylvania plan of release (and I think this theory sound) is that water should be released from the impounding reservoirs whenever the river drops to a low stage at either Port Jervis or at Trenton. In this manner the regimen of the river between Port Jervis and Trenton can be better preserved.

The parties have also stated their estimates in percentages in which the volume of flow in the river would be reduced under the operation of the New York plan. Professor Barrows states that on an average for the period May, 1914 to April, 1927 inclusive, the flow of the river would be reduced at Tri State Rock about 16% (Rec. 700).

Mr. Merriman states that for the period of his Exhibit 333 (1905 to 1929 both inclusive) the average annual reduction in the flow at Tri State Rock would be 14.6% (Rec. 4646).

At Riegelsville Professor Barrows states the average annual reduction of flow at 11½% (Rec. 727).

Mr. Merriman states the reduction at the same point as 8.7% (Rec. 4646).

Professor Barrows states the reduction in flow at Trenton at 8.2% (Rec. 736).

Mr. Merriman states the reduction at the same point as 8.3% (Rec. 4647).

At the Delaware-Pennsylvania State Line Mr. Merriman states the average annual reduction as 5.4% (Rec. 4647).

At points below the Delaware-Pennsylvania boundary line the average annual reduction of flow would be less.

I also state here the average flow of the Delaware River at several points in terms of c. s. m. and c. f. s. I take this information from Exhibit 401. Mr. Morgan, who introduced this map for Pennsylvania, states that the information contained therein is in substantial accord with similar information brought out in the New Jersey evidence and the New York evidence with some small differences, and I find this statement to be correct.

The average runoff or flow at Port Jervis is 1.84 c. s. m. which equals 5648 c. f. s.

The average runoff at Riegelsville is 1.78 c. s. m. which equals 11,018 c. f. s.

The average runoff at Trenton is 1.69 c. s. m. which equals 11,492 c. f. s.

Mr. Ryder, testifying on behalf of the State of Pennsylvania, stated that the effect of the Pennsylvania plan, as compared with the New York plan, would be to give a proportionately larger increase in the flow of the river during low stages (that is, stages below .5 c. s. m.) and that the Pennsylvania plan would also make a proportionately larger decrease in flow during high stages (that is, when the flow exceeds .5 c. s. m.) (Rec. 5790), and that the net result would be that, on the whole, about 9% more water would be released under the Pennsylvania plan than under the New York plan (Rec. 5767).

Mr. Ryder further stated that the diversion to New York City from the New York diversion area of 610 square miles means that New York City will take about 70% of the water yield of the diversion area, and that under the Pennsylvania plan 8.7% of the water yield of the diversion area would be released and that the remainder, or 21.3%, will go over the spillways (Rec. 5926).

He also testified that the Pennsylvania plan would require 8% more storage capacity than the New York plan (Rec. 5998).

As to the effect of the New York diversion, there is yet another important point to be mentioned, and that is the length of time which it will take releases of water from the impounding reserviors to reach Port Jervis and points farther south on the Delaware River and upon this point the parties are in wide disagreement.

Professor Barrows, testifying on behalf of the State of New Jersey, made tests to determine the time which it takes water to flow from Downsville, New York (where is to be located the main impounding reservoir of New York City)

to Port Jervis and Trenton. The first test was made in September, 1929 when the stage of the river at Port Jervis was about .45 c. s. m. A second test was made in March, 1930, when the stage of the river at Port Jervis was about 3½ c. s. m. The river between Downsville and Trenton was divided into five sections of about 50 miles each and oranges were placed in the river at the upper end of each section, and these oranges were followed by automobile and, in some instances, by boat. In some places where there were long pools of low velocity of flow, only a part of the pool was run with orange floats, and an estimate was made in such instances as to the rate of flow. Additional oranges were supplied when oranges became lost. The result of these tests of Professor Barrows is set out on his Exhibit No. 88.

Professor Barrows also made estimates of the time of transit of water at other stages of the river.

At a stage of .45 c. s. m. he states that the time of transit from Downsville to Tri State Rock is 132 hours and from Downsville to Trenton 265 hours. At a stage of 5 c. s. m. he states that the time of transit from Downsville to Tri State Rock is 55 hours and from Downsville to Trenton 110 hours.

The New York and Pennsylvania engineers, in stating the effect of releases on the Delaware River, took 24 hours as the time of transit from Downsville to Tri State Rock and 72 hours as the time of transit from Tri State Rock to Trenton.

Mr. Ryder, testifying for Pennsylvania, stated that the time of transit was based upon observations of the time of transit of what is called the Wallenpaupack wave. There is a power plant located at Hawley, Pennsylvania on the Lackawaxen River, which is a tributary of the Delaware, flowing into the Delaware above Port Jervis. This power plant releases water at noon daily and the time of transit of this released water was observed.

Mr. Ryder stated that he also used the records of the United States Geological survey from which he obtained

the time which it would take summer freshets at various stages of the river to pass from one point in the river to an other. He made no special test as to the time of transit between the impounding reservoirs and Port Jervis but based his figure for that transit on the usual difference between his figures and those of New Jersey. The New Jersey time of transit is about twice as long as the Pennsylvania and New York time and, in some instances, three or four times as long.

Mr. Ryder also stated, in answer to the question as to why he selected one day as the time of flow between reservoirs and Port Jervis and three days between Port Jervis and Trenton:

> "It was necessary for us to know the time between the reservoirs, or between Fish's Eddy, which is the gaging station used in determining the flow in our computations, for the water released from the reservoirs to reach Port Jervis in preparing the Port Jervis diagrams, and the time it would take such water released to reach Trenton in preparing the Trenton diagrams for flow at Trenton. As the time of travel varies at each stage in flow, in preparing our diagrams of flow we took the time that it would take the water to travel down the channel at some point near the 0.5 c. s. m. flow, or the 0.6 c. s. m. flow, which was the time on which under the Pennsylvania plan the releases were based. That time, as I have indicated, at those rates of flow in the river amounted to about 4 days between the reservoirs and Trenton. To have made our diagrams using different times with various rates of flow would have been an endless job. We could not possibly have gotten the work out, and if we had gotten it out, the chances are that there would still have been those slight inaccuracies, because the actual estimate of the time of transit is not absolutely accurate. So that to have gone to further time and further effort, we thought would be unnecessary, and as a matter of fact it was impossible." (Rec. 5847-8.)

He stated also that his figures as to time of flow of the Wallenpaupack wave were in substantial accord with the

observation of the time of transit of that flow made by the United States District Engineer's office at Philadelphia.

Mr. Merriman stated that the one day time of transit from the reservoirs to Port Jervis and the three days' time of transit from Port Jervis to Trenton represented his judgment from observations made on trips on the river.

None of these estimates of time of transit as given by the witnesses above named is entirely accurate. The time of transit necessarily changes with the stage of the river and the stage of the river is changing not only from day to day but from hour to hour. In the end the proper time of transit for making releases helpful and effective will have to be determined by actual experience in releases made from the impounding reservoirs.

My findings, however, is that the Pennsylvania time of transit (which is the same as the New York time) approximates accuracy nearer than the New Jersey time. Obviously oranges, used as floats, would encounter obstacles, particularly in a stream filled with rocks and shallows, and would be subjected to greater delays in transit than would a wave of water.

There was much conflict in the evidence as to the meaning of average flow, ordinary average flow, ordinary flow, flood flow and extraordinary flow. There were as many definitions as there were witnesses who testified as to the meaning of these terms.

The United States Weather Bureau (Exhibit 110 introduced by Mr. LeRoy Sherman on behalf of New Jersey) shows that a stage of 18 feet on the gauge is bank-full stage at Port Jervis and is also denominated as flood stage. At Phillipsburg, New Jersey the Weather Bureau states 22 feet on the gauge as bank-full stage and 22 feet as flood stage. At Trenton, New Jersey, the same Bureau designates 18 feet on the gauge as bank-full stage but 12 feet as flood stage. The ordinary flow as used by Mr. Merriman in the New York exhibits is stated to mean a flow equivalent to approximately 25% of the average annual flow. This

definition is evidently based upon the provisions of the proposed compacts.

Professor Barrows defines ordinary flow as "really a range of flows" . . . "about the average, that is" . . . "somewhere around 1-1/2 to 1.75 c. s. m."

Mr. Horton defines as ordinary flow "any flow which is not extraordinary"; "it would include all such flows as occur outside of the highest two or three months in the year".

Mr. Arthur E. Morgan states that the term flood flow is a "variable quantity" and that flood flow is something above the average annual flow.

Various authorities were referred to for definitions of different kinds of flows. I do not consider this matter of definitions important. The question is, the effect of the operation of the New York plan on New Jersey at whatever stage of the river water is diverted, whether the diversion be from flood flows, average flows or ordinary flows, or low flows.

To summarize, I find that under the operation of the New York plan, the level of the river on an average will be lowered at Tri-State Rock during the summer period (May-October) about 1⅞ inches and during the winter period (November-April) about 3⅜ inches, and at Trenton the river will be lowered on an average about 1½ inches during the summer period and about 2⅜ inches during the winter period, and that the average annual discharge of the river at Tri State Rock will be reduced about 14.6% to 16% and at Trenton about 8.3% and at the location of the natural oyster beds about 5%. I also find that when the natural discharge of the river at Port Jervis is low, that flow will generally but not always be increased under the operation of the New York plan of releases and will always be increased under the operation of the Pennsylvania plan of releases. I am using here the term low flow as a flow below .45 c. s. m. (1381 c. f. s.).

I further find that the exhibits of New Jersey and New York City showing the daily effect of the operation of the

New York plan present a more accurate picture than exhibits giving averages by months or by years, though averages are not to be ignored, and I am setting out in the appendix "B" hereto a comparison of the effect of the operation of the New York plan at Port Jervis as estimated by Mr. Merriman for the City of New York and the effect at Tri State Rock as estimated by Mr. Horton for the State of New Jersey. The preiod covered by this comparison is January, 1925 to September, 1929.

Taking into consideration that the New York figures apply to Port Jervis and the New Jersey figures to Tri State Rock (Tri State Rock being affected by a diversion area of 70 square miles more than Port Jervis), and the difference in the New Jersey and New York estimates of the time of transit of released waters from the reservoirs to Port Jervis and Tri State Rock, I do not find that the New Jersey and New York results are, as a general rule, different to any great degree.

VIII.

NAVIGABILITY OF DELAWARE RIVER AND THE FOLLOWING TRIBUTARIES THEREOF: NEVERSINK, WILLOWEMOC, BEAVER KILL, EAST BRANCH AND LITTLE DELAWARE.

It is important to ascertain at the outset whether the Delaware river is a navigable stream and also whether the five tributaries thereof (in which dams are to be constructed) are navigable streams.

Undoubtedly the test as to whether a stream is navigable in law is whether it is navigable in fact. This rule has been repeatedly announced by this court. In the case of *United States v. Rio Grande Dam and Irrigation Company*, 174 U. S. 690, the question arose as to whether the portion of the Rio Grande river in the territory of New Mexico was a navigable stream. In disposing of this question this court said:

"Examining the affidavits and other evidence introduced in this case, it is clear tous that the Rio Grande is not navigable within the limits of the territory of New Mexico. *The mere fact that logs, poles, and rafts are floated down a stream occasionally and in times of high water does not make it a navigable river.* It was said in *The Montello,* 20 Wall. 430, 439 (22:391, 394), 'that those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.' And again (p. 442 (22: 394): 'It is not, however, as Chief Justice Shaw said (*Rowe v. Granite-Bridge Corp.*) 21 Pick. 344, "every small creek in which a fishing skiff or gunning canoe can be made to float at high water, which is deemed navigable, but in order to . . . give it the character of a navigable stream, . . . it must be generally and commonly useful to some purpose of trade or agriculture." '

"'Obviously, the Rio Grande within the limits of New Mexico is not a stream over which in its ordinary condition trade and travel can be conducted in the customary modes of trade and travel on water. Its use for any purposes of transportation has been and is exceptional, and only in times of temporary high water. The ordinary flow of water is insufficient. It is not like the Fox river, which was considered in the Montello, in which was an abundant flow of water and a general capacity for navigation along its entire length, and although it as obstructed at certain places by rapids and rocks, yet these difficulties could be overcome by canals and locks, and when so overcome would leave the stream in its ordinary condition susceptible of use for general navigation purposes. We are not, therefore, disposed to question the conclusion reached by the trial court and the supreme court of the territory, that the Rio Grande within the limits of New Mexico is not navigable."

And more recently this court in the case of *Economy Light & Power Company v. United States,* 256 U. S. 113

said that the test of navigability is "whether the river, in its natural state, is used, or capable of being used, as a highway for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water." The court in this case re-affirmed the principles laid down in the earlier cases of The Daniel Ball, 10 Wall. 557, 563 and The Montello, 20 Wall. 430. In the course of the opinion the court said:

> "We concur in the opinion of the circuit court of appeals that a river having actual navigable capacity in its natural state, and capable of carrying commerce among the states, is within the power of Congress to preserve for purposes of future transportation, even though it be not at present used for such commerce, and be incapable of such use according to present methods, either by reason of changed conditions or because of artificial obstructions. And we agree that the provisions of Section 9 of the Act of 1899 (30 Stat. at L. 1141, chap. 425, Comp. Stat. Section 9971, 9 Fed. Stat. Anno. 2d ed. p. 81) apply to such a stream. The act in terms applies to '*any* navigable river, or other navigable water of the United States;' and, without doing violence to its manifest purpose, we cannot limit its prohibition to such navigable waters as were, at the time of its passage, or now are, actually open for use. The Des Plaines river, after being of practical service as a highway of commerce for a century and a half, fell into disuse, partly through changes in the course of trade or methods of navigation, or changes in its own condition partly as the result of artificial obstructions. In consequence, it has been out of use for a hundred years; *but a hundred years is a brief space in the life of a nation;* improvements in the methods of water transportation, or increased cost in other methods of transportation, may restore the usefulness of this stream; since it is a natural interstate waterway, it is within the power of Congress to improve it at the public expense; and it is not difficult to believe that many other streams are in like condition, and require only the exertion of Federal control to make them again important avenues of commerce among the states. If they are to be abandoned, it is for Congress,

not the courts, so to declare. The policy of Congress is clearly evidenced in the Act of 1899, and, in the present case at least, nothing remains but to give effect to it."

In the still more recent case of United States vs. Holt State Bank, 270 U. S. 49, this court said:

> "The rule long since approved by this court in applying the Constitution and laws of the United States is that streams or lakes which are navigable in fact must be regarded as navigable in law; that they are navigable in fact when they are used, or are susceptible of being used, in their natural and ordinary condition as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water; and further that navigability does not depend on the particular mode in which such use is or may be had,—whether by steamboats, sailing vessels or flatboats,—nor on an absence of occasional difficulties in navigation, but on the fact, if it be a fact, that the stream in its natural and ordinary condition affords a channel for useful commerce. The Montello, 20 Wall. 430, 439, 22 L. ed 391, 394; United States v. Cress, 243 U. S. 316, 323, 61 L. ed. 746, 751, 37 Sup. Ct. Rep. 380; Economy Light & P. Co. v. United States, 256 U. S. 113, 121, 65 L. ed. 847, 854, 41 Sup. Ct. Rep. 409; Oklahoma v. Texas, 258 U. S. 574, 586, 66 L. ed. 771, 776, 42 Sup. Ct. Rep. 406; Brewer-Elliott Oil & Gas Co. v. United States, supra, p. 86 (67 L. ed. 145, 43 Sup. Ct. Rep. 60)."

When we come to examine the evidence it clearly appears that navigation of the Delaware River is regularly carried on from Trenton southward to Philadelphia and thence on to the Atlantic Ocean. The present project depth from Trenton to Philadelphia is twelve feet, though this project depth is now in process of being increased to twenty feet. There is no conflict or contest as to the navigability of the Delaware River from Trenton southward. From Trenton northward to Hancock, New York, which is at the junction of the East and West Branches of the Delaware River, the evidence shows that there is at present no navigation of a

commercial kind on the Delaware River, nor has there been any such navigation for probably more than thirty years. The evidence is equally clear, however, that during the nineteenth century and the previous century and even before there was a considerable commerce conducted on the Delaware River from Trenton northward to the junction of the East and West Branch and perhaps for a short distance beyond. Before the advent of railroads in that part of the country, what is known as Durham boats were regularly operated on the Delaware River. It is true that this was a crude form of transportation, the boats being moved up the river by means of animal power or by the use of poles. Before the cutting away of the forests along the north end of the Delaware River and its tributaries there was a large movement of rafts or logs from the upper reaches of the river to Trenton and Philadelphia. The Durham boats carried commerce of all kind, live stock, merchandise and passengers. Living witnesses of eighty to ninety years of age were introduced who had observed the operation of Durham boats on the river. A very accurate description of the topographical features of the Delaware River and the commerce formerly conducted thereon is contained in the report of the Chief of Engineers of the United States Army for 1873. In the report of the United States Assistant Engineer (located at Philadelphia) to the Chief of Engineers at Washington, D. C. there occurs the following:

> "This noble river exhibits along its immediate valley a considerable variety of topographical feature and scenery. From its head-streams in New York to where it emerges from the Pokono or Catskill Mouuntains, it flows in a tortuous course through a deep trough in that elevated table-land; the mean level of the plateau remaining constant and the valley growing progressively deeper; the river-hills grow higher and higher as it descends. Meandering much more than the valley containing it, the river sweeps sometimes close by the base of the bounding hills, the lower part of which are, in many cases, faced by high naked cliffs, exposing the

red-brownish shales of sand-stones of the district. The perspective of jutting and retreating hills, clothed with a combination of coniferous and deciduous forest to their summits, and washed at their base by long, bending reaches of the broad river, is very attractive, notwithstanding a prevailing sameness in general feature. After leaving the plateau in Pike and Wayne Counties the river emerges into a broad, open valley, wholly different in structure and aspect from that which it has left. The waters which carved a way for it seem to have been impelled in their momentum southward with great energy against the strong, stony barrier of the Kittatinny or Shawaugunk Mountain, and to have scooped their deepest trench near the base of that high ridge. The river, therefore, turns abruptly near Carpenter's Point from a southeast to a southwest course, and follows that of the mountain, sometimes hugging its base, sometimes sweeping a moderate distance from it into the plain, until it finds a passage through it at the great breach called the Delaware Water-Gap. The scenery along this stretch of the river is eminently beautiful. Low within the valley the river is bordered by cultivated flats, variously carved in one or more terraces; and behind these, particularly on the northwest, rise numerous rolling hills, some under the plow, some covered with timber, all deeply cut by ravines; while still beyond the hills we see ascending the long slopes or bold escarpments of the plateau of the Upper Delaware. All the way along on our left the view is bounded by the forest-covered flank and straight crest of the Kittatinny Mountain. Turning at the Water-Gap, the river, in issuing through the main ridge of the mountain, passes between nearly perpendicular mural cliffs of gray sandstone rising on either side to its crest.

"Leaving the Water-Gap, the river descends gently southward, obliquely across the entire breadth of the Appalachian plain to where it enters the hills called the 'South Mountains' below Easton. This portion of its course is marked by no striking features, the surface of the country being elevated only 100 to 200 feet above it, and being, from the softness of the slates or limestones, smoothed down into rather inexpressive lines.

"Below the mouth of the Lehigh, the Delaware is bordered by an alternation of hills, and narrow, intervening valleys, the river-hills being but the ends of the intersected ridge of the chain of the Highlands of New Jersey. But from the southern edge of these hills, at Durham, the scenery for many miles southward wears a wholly different character. It is that of a table-land, elevated 300 to 400 feet above the level of the river, cut, on one or both sides of the valley, into long ranges of perpendicular cliffs, or excessively steep slopes. One range of precipice on the Pennsylvania side, known as the Nockamixon Rock, is an exceedingly striking and picturesque range of beetling cliffs, rising sheer, for 200 feet, from the brink of the river, with only a narrow roadway and canal between them, through a length of nearly three miles. Some of the views from the base of these cliffs are almost grand, and the pictures they make, with the river below, are beautiful.

"Farther down the valley the Delaware passes, near New Hope, some bold sides of trap-rock, which impart a pleasing variety to its banks, elsewhere in this part of its course comparatively tame. Passing Trenton, its borders presently put on a totally changed aspect, ceasing to be a gay, running stream; full of bushy islands, and rocky reefs, and rapids, it becomes a wide, tidal river, rising and ebbing between shores which are, in many places, only low banks of sand and gravel, and in others broad marshes covered with reeds and grass. Turning, at Bordentown, southwestward, the river maintains these features all the way to its wide estuary, the Delaware Bay.

"The only navigation at present upon the Delaware River, above Trenton, is that of the rafts which come down during the spring and fall floods. Previous, however, to the construction of canals and railroads, the river, although difficult to navigate, was an important highway of commerce. The boats first used appear to have been narrow, flat-bottomed scows, from 25 to 40 feet in length, which were allowed to float down with the current, and on their return up were propelled by poles. About the year 1750 'Durham' boats were introduced, socalled from having been first built at Durham Village, ten miles below Easton.

"These were round-bottomed boats, pointed at both stern and bow, about 60 feet long, 10 wide, and 5 deep, with a low cabin for sleeping apartment, and one aft for provisions; the center of the boat was thus left free for the load. The crew consisted of three men, two with long setting-poles, and one at the rudder, who also used a shorter pole. When fully loaded they drew about 30 inches; the usual load on the down trip being 20 tons, on the up trip 5 to 10 tons. The time usually required for a trip from Easton to Trenton was one day, while the return trip ordinarily occupied three days. About 1810 coal began to be carried down the river in 'arks,' which were simply rectangular pine boxes, usually hinged in the middle like canal-boats, and being from 50 to 80 feet long and 16 feet wide, and drawing 2 feet of water. These were furnished with oars for use on the reaches of the river between rapids. On arriving at the market in Philadelphia, after discharging their cargoes, the arks were taken apart, the lumber sold, while the iron-work was carried back across the country to the Lehigh, to be used again in the construction of others. The Delaware division of the Pennsylvania Canal, finished in 1830 from Easton to Bristol, caused both Durham boats and arks to be but little used after that time. It is proper to mention here that the river was navigated by Durham boats as far as Lackawaxen Creek, seventy-five miles above Easton, and probably much farther.

"The completion of the Belvidere Delaware Railroad, in 1857, rendered any further navigation of the river, except by rafts, unnecessary. Previous to that time, however, it was often customary during the winter season, while the canal was closed, to send canal-boat loads of coal down the river. This could, however, only be done at times of freshet, as several feet of water were required for their safe passage.

"In the summer of 1851, in order to facilitate communication with Easton, and the railroad only being built as far as Lambertville, a steamboat, the Major William Barnet, drawing, when loaded, only 18 inches, was run from Lambertville to Easton, the time occupied in making the trip of thirty-six miles being about eight hours. The lumber business of the river

probably began at an early date. Beginning at the lower part of its course, its inclosing banks have been stripped of their forest growth, the work continually receding up the river, until now the lumber production is confined mostly to the counties of Broome, Delaware, and Sullivan, in New York, and Wayne and Pike, in Pennsylvania. The most valuable woods, pine and oak, were first brought to market. In the year 1824, when these timbers were becoming scarce and hemlock was beginning to be cut, the lumber trade appears to have been about two-thirds as large as at present. From 1835 to 1850 it was greater than ever before, and probably exceeded the present production by one-third or one-half. The trade on the Delaware is now declining, and it is estimated that in twenty-five or thirty years will cease altogether."

At the present time there is no commercial navigation on the Delaware River above Trenton. Even the rafts have disappeared. In the light, however, of the decisions of this court above referred to, I have no hesitation in finding that the Delaware River constitutes navigable waters of the United States from Trenton northward to the junction of the East and West Branch at Hancock, New York and for an undefined distance above Hancock on the East Branch and the West Branch. At the present time the use of the river, so far as navigation is concerned, is confined to the operation of motor boats and canoes for recreational purposes.

Navigability of Neversink, Willowemoc, Beaver Kill, East Branch and Little Delaware.

The above mentioned tributaries are located wholly within the State of New York. I find that they are non-navigable streams at the points where the proposed dams are to be erected by the City of New York.

There is no proof that Durham boats were ever operated on the portion of these rivers where the dams are located, nor is there any proof of any other kind of commercial navigation except in some instances in early days rafts of

logs may have been floated. As said, however, by this court in *United States v. Rio Grande Dam & Irrigation Co.* 174 U. S. 698 "the mere fact that logs, poles and rafts are floated down a stream occasionally and in times of high water does not make it a navigable river." The evidence in this case shows that rafts or logs could be and were floated only in times of high spring freshets.

The plaintiff in this case relies upon certain legislation of the State of New York declaring some or perhaps all of these rivers to be public highways.

Chapter CLXI of the New York Laws of 1816, page 74, is an act which declares "That the said Neversink River, from the mills of Thomas S. Lockwood, aforesaid, to its junction with the Delaware River, be and the same is hereby declared a public highway." From the best location that can now be made of the place where the mills of Thomas S. Lockwood were formerly located, it appears that the proposed dam of the City of New York in the Neversink River is above said mills and, therefore, not within the portion of the Neversink River declared to be a public highway by the legislature of New York.

Chapter CXXIX of the Laws of New York, 1817, page 171, declares the Beaver Kill River to be a public highway from the Delaware River and up the same "to the intersection of the Willowemack and little Beaverkill."

Chapter CXCV of the Laws of New York 1882, page 185, provides:

> "That all that part of the Delaware River, from Carpenter's Point, near the north boundary of the state of New Jersey, to the northerly boundary of the town of Delhi, in the county of Delaware, and also all that part of the east branch of the said river, from the forks where it forms a junction with the west branch in the town of Hancock to the farm of Frederick Kittle, in the town of Middletown, in said county; and all that part of the Beaver kill (stream tributary to the said east branch), which is within the said county of Delaware, be, and the same are hereby declared each to be a public highway."

It is not entirely clear whether these acts embraced the locations of any of the proposed dams.

However, I deem it totally immaterial for the reason that the determination of whether or not a stream is navigable is a question of fact and the mere declaration of the state legislature that a stream is a public highway does not make it navigable in fact. In *Farnham on Waters*, section 24, page 119 it is said:

> "But if the stream is not in fact navigable, it cannot be made so by the mere passage of a statute."

This appears to be also the New York Rule. *Morgan v. King*, 35 N. Y. 459. Nor does the fact that Congress authorizes the construction of a bridge across a river render it navigable.

In *National Surety Co. v. Lincoln County*, 238 Fed. 710 the Circuit Court of Appeals for the Ninth Circuit said:

> "The fact that Congress passed an act authorizing the construction of the bridge does not of itself establish the navigability of the stream."

And lastly this court said in *Economy Light & Power Company vs. U. S.* 256 U. S. 120:

> "There can be no doubt that the waters of the Chicago-Des Plaines-Illinois route 'and the carrying places between the same' constituted one of the routes of commerce intended by the ordinance, and the subsequent acts referred to, to be maintained as common highways. *It did not make them navigable in law unless they were navigable in fact*, but declared the public rights therein so far as they were navigable in fact."

I conclude, therefore, that the Neversink, Beaver Kill, Willowemoc, East Branch and Little Delaware rivers are not navigable waters of the United States at and above the places where the City of New York proposes to erect dams.

I may add that even though they were navigable waters yet they are wholly located within the State of New York, and I am unable to see upon what ground the State of New

Jersey has the right to complain of dams placed in these rivers unless the effect of these dams would be to reduce the navigable capacity of the Delaware River itself within the State of New Jersey. The question as to whether the carrying out of the New York plan affects the navigable capacity of the Delaware River is dicussed under another heading.

IX

NAVIGATION.

The State of New Jersey contends that the City of New York cannot erect the proposed dams or divert the waters of the tributaries of the Delaware River without the affirmative authority of Congress and the approval of plans by the Secretary of War and Chief of Engineers of the United States Army, and without the consent of New Jersey.

The bill charges that the effect of the proposed diversion will be to obstruct navigation and reduce the navigable capacity of the Delaware River. The evidence shows that the defendant city has not a permit from Congress or the Secretary of War for the erection of dams in the tributaries of the Delaware River, or for the diversion of waters as proposed. The record, however, also shows that the City of New York has placed before and acquainted the War Department with its plan of diversion and of the works which it proposes to construct. No permit has been definitely asked by the defendant city, the communication from the City of New York to the War Department merely being in the nature of information as to what the city proposes to do. The record also shows that the War Department has maintained observers at all of the hearings of evidence in this cause and that copies of the evidence and the exhibits have been furnished to the War Department so that the War Department is fully acquainted with the status of the case. The pendency of this cause and the issues

involved have also been brought by the special master to the attention of the Department of Justice, but there has no intervention in the case by the United States.

The State of New Jersey calls particular attention to the Act of March 3, 1899, chapter 425, 30 Stat. 1151. Sections 9 and 10 of said act are set out as Sections 401 and 403 of the United States Code Annotated (Title 33) and for convenience are copied below:

"Section 401. Construction of bridges, cause-ways, dams or dikes generally. It shall not be lawful to construct or commence the construction of any bridge, dam, dike, or causeway over or in any port, roadstead, haven, harbor, canal, navigable river, or other navigable water of the United States until the consent of Congress to the building of such structures shall have been obtained and until the plans for the same shall have been submitted to and approved by the Chief of Engineers and by the Secretary of War; *Provided*, That such structures may be built under authority of the legislature of a State across rivers and other waterways the navigable portions of which lie wholly within the limits of a single State, provided the location and plans thereof are submitted to and approved by the Chief of Engineers and by the Secretary of War before construction is commenced: *And provided further*, That when plans for any bridge or other structure have been approved by the Chief of Engineers and by the Secretary of War, it shall not be lawful to deviate from such plans either before or after completion of the structure unless the modification of said plans has previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War."

"Section 403. Obstruction of navigable waters generally wharves; piers, etc.; excavations and filling in. The creation of any obstruction not affirmatively authorized by Congress, to the navigable capacity of any of the waters of the United States is hereby prohibited; and it shall not be lawful to build or commence the building of any wharf, pier, dolphin, boom, weir, breakwater, bulkhead, jetty, or other structures in any port, roadstead, haven, harbor, canal, navigable river or

other water of the United States, outside established harbor lines, or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of War; and it shall not be lawful to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of, any port, roadstead, haven, harbor, canal, lake, harbor of refuge or inclosure within the limits of any breakwater or of the channel of any navigable water of the United States, unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of War prior to beginning the same."

Section 9 has no application to the present case as the dams which are proposed to be erected are not in navigable waters of the United States, as has been shown. There is no dam proposed to be constructed in the Delaware River itself.

Section 10 of the Act of 1899 (403 of the United States Code Annotated) does have application provided the dams which are proposed to be constructed by the City of New York in the tributaries of the Delaware River will have the effect of unreasonably reducing the navigable capacity of the Delaware River which, as has been shown, does constitute navigable waters of the United States.

Notwithstanding these dams are in non-navigable waters, yet the paramount authority of the national government extends to them in the event the effect, as stated, is to reduce the navigable capacity of the Delaware River.

(The Act of Congress of March 3, 1899 supersedes the previous Act of Congress of September 19, 1890, and rearranges the language thereof, with some changes, but not in such a manner as to affect the applicability of the case next to be mentioned.)

In the case of United States vs. *Rio Grande Dam and Irrigation Company,* 174 U. S. 690, it was held that the Act of Congress relative to reducing the navigable capacity of any navigable river of the United States extended the power of the national government to non-navigable por-

tions of a navigable stream when the thing which is done, even though it be in the non-navigable portion of the stream, has the effect of obstructing the navigable capacity of the navigable portion of the stream. That case involved a diversion of water for irrigation purposes. In that case the court said:

> "This act (26 Stat. at L. 454, sec. 10) declares that 'the creation of any obstruction, not affirmatively authorized by law, to the navigable capacity of any waters in respect to which the United States has jurisdiction is hereby prohibited.' Whatever may be said in reference to obstruction existing at the time of the passage of the act, under the authority of state statutes, it is obvious that Congress meant that thereafter no state should interfere with the navigability of a stream without the condition of national assent." . . .
>
> "It is not a prohibition of any obstruction to the navigation, but any obstruction to the navigable capacity, and anything wherever done or however done, within the limits of the jurisdiction of the United States which tends to destroy the navigable capacity of one of the navigable waters of the United States, is within the terms of the prohibition." . . .
>
> "Of course, when such proceedings are instituted it becomes a question of fact whether the act sought to be enjoined is one which fairly and directly tends to obstruct (that is, interfere with or diminish) the navigable capacity of a stream. It does not follow that the courts would be justified in sustaining any proceeding by the Attorney General to restrain any appropriation of the upper waters of a navigable stream. The question always is one of fact, whether such appropriation *substantially* interferes with the navigable capacity within the limits where navigation is a recognized fact." . . .
>
> "The Hudson River runs within the limits of the State of New York. It is a navigable stream and a part of the navigable waters of the United States, so far at least as from Albany southward. One of the streams which flows into it and contributed to the volume of its waters is the Croton River, a non-navigable stream. Its waters are taken by the State of

New York for domestic uses in the city of New York. Unquestionably the state of New York has a right to appropriate its waters, and the United States may not question such appropriation unless thereby the navigability of the Hudson be disturbed. On the other hand, if the state of New York should, even at a place above the limits of navigability, by appropriation for any domestic purposes, diminish the volume of waters, which, flowing into the Hudson, make it a navigable stream, to such an extent as to destroy its navigability, undoubtedly the jurisdiction of the national government would arise and its power to restrain such appropriation be unquestioned; and within the purview of this section it would become the right of the Attorney General to institute proceedings to restrain such appropriation.

"Without pursuing this inquiry further we are of the opinion that there was error in the conclusions of the lower courts; that the decree must be reversed, and the case remanded, with instructions to set aside the decree of dismissal, and to order an inquiry into the question whether the intended acts of the defendants in the construction of a dam and in appropriating the waters of the Rio Grande will *substantially diminish* the navigability of that stream *within the limits of present navigability*, and if so, to enter a decree restraining those acts to the extent that they will so diminish."

I entertain no doubt, therefore, that there is a basis for injunctive relief in the event the construction of the proposed dams by the City of New York has the effect of substantially diminishing the navigability or navigable capacity of the Delaware River. New Jersey has a right to make this question. *Wisconsin v. Illinois,* 278 U. S. 367. It will be noticed that in the above opinion the court construes the statute to apply not to any and every obstruction to navigable capacity however small or trivial, but the statute is aimed at and applies to such an appropriation of water as "*substantially* interferes with the navigable capacity," and the case was remanded to determine whether the construction of a dam in the Rio Grande River

will "*substantially* diminish the navigability of that stream." It is, therefore, only substantial interference or obstruction of navigability and navigable capacity to which the act applies. The statute was considered and construed by this court in *Wisconsin v. Illinois*, 278 U. S. 367. In that case this court said:

> "The true intent of the act of Congress was that *unreasonable* obstructions to navigation and navigable capacity were to be prohibited, and in the cases described in the second and third clauses of Sec. 10, the Secretary of War, acting on the recommendation of the Chief of Engineers, was authorized to determine what in the particular cases constituted an *unreasonable obstruction.*"

It is noted in the above excerpt the court uses the expression "unreasonable obstruction" to navigation and navigable capacities. In order to determine the extent to which the navigable capacity of the Delaware River would be affected by the New York diversion, I called, on my own initiative, as a witness, General George B. Pillsbury, Assistant Chief of Engineers of the United States Army, as General Pillsbury had previously been in charge of the Delaware River while located as District Engineer at Philadelphia and was well acquainted with the proposed plan of the City of New York. General Pillsubry's evidence was clear, precise, forceful and convincing. In the course of his evidence he testified as follows (p. 6041-45):

> In September of 1929 I received from the Board of Water Supply of the City of New York a letter which is already in the exhibits in this hearing, informing the Department of their plan for the development of a new and additional water supply from drainage areas in the head waters of the Delaware. The existence of such a plan had been known and had been generally considered in connection with the survey to which I have referred, but on receipt of this letter from the Board of Water Supply careful and detailed computations were made to determine the effect of the diver-

sion and release set forth in that plan on the navigation and the navigable capacity of the Delaware (6042) River.

Of course, the Delaware River is quite distinctly divided into two sections: the tidal section extending up to Trenton and the non-tidal section above Trenton. There has been a project authorized by Congress and partly completed for a channel 35 feet in depth as far as Philadelphia and another project for a channel 20 feet in depth from Philadelphia to Trenton. The last-mentioned project, the 20-foot channel, is now in process of execution, but has not far progressed. The present navigable depth up to Trenton provided under a previous project is 12 feet. All of these depts refer to low water.

There is a tidal range at Trenton varying from nearly six feet, at the time when the discharge of the river is at its minimum, to nothing when the discharge of the Delaware has reached the vicinity of 90,000 cubic feet per second.

Navigation is interested ordinarily and primarily in the depth at low water, at low tide; although a very important navigation is frequently carried on in the depth at high tide.

The investigations made under my direction brought out the following conclusions as to the effect of the diversion on the water levels at Trenton, at (6043) the head of the 12-foot channel:

They showed that for a very small percentage of the time and at lowest river discharge and lowest river levels the diversion would, in the long run, increase the low water heights by about one-tenth of a foot, due to the release provided in the plan.

During ordinary low water levels of less than one foot above the minimum level, which levels occur during about 40 per cent. of the time, *the diversion will decrease the low tide level by from one-tenth to fifteen hundredths of a foot and the high levels by much less than one-tenth of a foot.*

At higher discharges, when the low level is from one to seven feet above minimum low water, diversion may decrease the elevation at low tide by as much as half a foot and at high tide by as much as two-tenths of a foot.

So far as navigation is concerned, the effect of a diversion on navigation at and below Trenton will be practically nothing when the river level is at the project plane of mean low water. When the discharge without the diversion is such a sto give 21 feet in the channel at low tide the depth with the diversion would be 20.85 feet. When the river discharge is such as to give without diversion 22 feet in (6044) the channel at low tide, the depth with the diversion would be, in the long run, 21.75 feet.

These small differences are far below the accuracy obtainable in dredging and surveying the channel and are far beyond the practical utilization of the channel for navigation.

The effect of a diversion at any point below Trenton will be less than the effect at Trenton; this effect decreasing at successive points down-stream. While, therefore, the diversion will decrease the high stages of the river by about five-tenths of a foot, yet from the point of view of present-day navigation that decrease will not, in my opinion, adversely in any manner at all affect navigation; because the vessels would be loaded, under present conditions of navigation, to meet the conditions that they can assuredly count on. Those high stages occur for but brief periods of time, and a diminution of as much as half a foot in those high stages will not, in my opinion, adversely affect navigation. I, therefore, reported to the Department that in my opinion the Department was not justified in intervening in the case at the present time on account of the effect of the diversion on navigation.

(6045) The river above Trenton has so steep a slope that the only practicable means for its improvement is by locks and dams. I have read Colonel Kutz's testimony as to the amount of water required for navigation with such locks and dams; and, although I have not checked his figures, my general experience indicates that they are correct.

And also he stated as follows (p. 6046):

"A. The Delaware River above Trenton at the present time carries practically no navigation. To render it navigable, to render it useful for navigation under

present conditions, would require the construction of locks and dams to provide a slack water improvement. The slope is so steep that a useful channel for present navigation cannot be secured by dredging and rock excavation alone. The amount of water required for the operation of those locks and dams is so small that the flow remaining in the river after the diversion would be much more than ample for the purpose. So that the diversion would not, in my opinion, interfere in any manner with any future improvement of the Delaware River above Trenton, which Congress may make."

This evidence sets at rest to my mind any question as to the reduction of navigable capacity. General Pillsbury was supported in his evidence by Col. C. W. Kutz, a retired officer of the Corps of Engineers of the United States Army. There was evidence to the contrary by a number of witnesses, though Mr. L. C. Sabin, the Vice President of the Lake Carriers Association of Cleveland, Ohio, stated, when introduced as a witness by New Jersey, that in a general way he agreed with most of the statements of General Pillsbury and that General Pillsbury's evidence was possibly correct if properly interpreted. I am of the opinion that General Pillsbury's evidence is too clear to need interpretation. Interpretation would not clarify, for it is already clear.

I am, therefore, of the opinion that there is no basis for injunctive relief on the part of New Jersey on the ground that the carrying out of the New York plan would obstruct navigation or impair the navigable capacity of the Delaware River. While it is true that General Pillsbury stated that his evidence was unofficial, yet I feel bound to give great weight and credence to the evidence of this highly qualified and disinterested witness.

Nevertheless, any decree rendered in this case is necessarily subject to the paramount authority of Congress over navigation, as well as the authority of the Secretary of War and Chief of Engineers, in pursuance of the powers granted to them. The United States is not a party to this

suit and in no way bound by any decree which may be rendered. New York City must take the risk of any action which Congress or the War Department may see fit to take affecting the carrying out of the plans of that city. The extent of my finding is that *on the proof in this record* there will be no unreasonable obstruction or interference with navigation or the navigable capacity of the Delaware River by reason of the execution of the plan of the City of New York.

X.

WATER POWER.

The bill of complaint contains the following allegation:

> "33. The Delaware River basin above tidewater is capable of the feasible development of water power, at a cost less than the ordinary cost of producing commercial power, in excess of 350,000 horsepower (firm power), or in excess of 2,000 million kilowatt-hours per year, of a net value in excess of 18 million dollars per year. A considerable portion of this available power is located within the territorial limits of the plaintiff. A population in excess of nine million people within a radius of fifty miles of the various power sites affords ample market for such power. The diversion of water proposed by said City will forever destroy the opportunity for the feasible commercial development of all, or a considerable proportion, of said water power, including that within the territorial limits of the plaintiff" (p. 19).

The defendant City denies the above allegations of the bill and also makes the following defense:

> "*Thirty-seventh.* Practically all of the sites feasible for the development of water power on the watershed of the Delaware River are located within the territorial confines of the States of New York and Pennsylvania. Only a small portion of the possible total which may be developed is situated within the territorial limits

of the plaintiff. All of the power possibilities along the channel of the Delaware River below Tri-State Rock are within the joint jurisdiction of the plaintiff and the Commonwealth of Pennsylvania, which by their compact of 1783 bound themselves to keep the Delaware River forever open as a public highway and until the said compact of 1783 is abrogated or modified, neither right nor authority exists for the construction of any dam across the channel of the Delaware River, thus rendering impossible the development of the Delaware River for water power purposes by the plaintiff'' (p. 23).

It appears from the proof that the so-called compact of 1783 between the states of New Jersey and Pennsylvania relative to keeping the Delaware River open as a public highway was brought about as the result of an agreement between commissioners appointed by each state. The agreement of these commissioners is in writing and is dated April 26, 1783. This agreement was ratified by the legislature of New Jersey on May 27, 1783 and by the legislature of Pennsylvania on September 20, 1783 and is set out in Plaintiff's Exhibit 119.

The essential part of the agreement is that the Delaware River "is and shall continue to be and remain a common highway equally free and open for the use, benefit and advantage of the said contracting parties." This concurring legislation of the two states is referred to in the record as a compact between the two states and as the "anti-dam legislation" of the two states. This legislation does not, in terms, forbid the construction of dams across the Delaware River between the New Jersey shore and the Pennsylvania shore, but inasmuch as the agreement of the commissioners ratified by the two states declares the river to be a common highway, free and open for the use, benefit and advantage of the contracting parties, I am of the opinion that under this agreement neither state could build a dam across the river and thereby obstruct navigation without the consent of the other state. I think, therefore, that under the terms of this compact, dams across the Delaware

River between New Jersey and Pennsylvania could not be built for the purpose of developing water power. The question arises, however, as to whether this compact is still in force and effect.

When the Constitution was adopted, the states of New Jersey and Delaware granted to the national government the right to regulate interstate and foreign commerce and, in so far as this compact interferes with that power of the national government, it is necessarily no longer effective. Under the paramount authority of the national government to regulate commerce, I think it is clear that the Government of the United States may, in the interest of regulating commerce, construct dams across the Delaware River without the consent of either New Jersey or Pennsylvania, though, of course, the title to the land upon which such dams will be located will have to be acquired by either purchase or condemnation and, likewise, the United States would, under familiar constitutional principles, be required to pay for any lands actually taken as the result of the impounding of waters, such as lands which would be flooded.

On the other hand, I am of the opinion that this compact is still in force and effect to the extent that neither New Jersey nor Pennsylvania can lawfully, without the consent of the other, authorize any person or corporation to construct a dam across the Delaware River between New Jersey and Pennsylvania. And, furthermore, no such dam could be constructed without the affirmative authority of Congress as provided in Section 9 of the Act of March 3, 1899 (Sec. 401 United States Code Annotated).

I am, therefore, of the opinion that for any person or corporation to dam the Delaware River between New Jersey and Pennsylvania, in order to create water power, it would be necessary to obtain the consent, first, of the United States, second, New Jersey and, third, Pennsylvania. Indeed, this seems to be conceded by the State of New Jersey, as in the brief filed with me by that State it is said:

"It is conceded that if a private enterprise undertook to develop water power, the approval of the legislatures of each of the states, or of the proper board or body therein to whom such power may have been delegated should be obtained, but it is not to be presumed that either state would oppose a project in the public interest as long that public interest, and public and private rights, were conserved by proper safeguards. This has been done in a great many places under special charters or general laws enacted by the interested states, respectively, and it is assumed that any such enterprise undertaken on the Delaware River would be commenced only after proper legislative authority had been obtained, not only from the states, but from Congress, as well as the approval of the Secretary of War and the Federal Power Commission" (p. 333).

The paramount authority of Congress over navigable streams notwithstanding compacts between the states (such compacts being entered into previous to the adoption of the Federal Constitution) is illustrated by the decision of this Court in *South Carolina v. Georgia*, 93 U. S. 3. In that case it appeared that there was a compact entered into between South Carolina and Georgia, previous to the adoption of the Constitution, under which it was agreed that the boundary between the two states should be the north branch of the Savannah River, and that the navigation of the river along a specified channel should forever be equally free to the citizens of both states and exempt from any hindrance or interruption attempted to be enforced by the citizens of one state on the citizens of the other. After the adoption of the Constitution, the Federal Government determined that the interests of navigation would be subserved by the obstruction of the north channel, and it was held by this Court, that notwithstanding such obstruction would be in contravention of the compact between the two states, yet such obstruction would be lawful in view of the paramount authority of Congress over the regulation of commerce and, therefore, over navigation. Said the Court:

"After the Treaty between the two States was made, both the parties to it became members of the United States. Both adopted the Federal Constitution, and thereby joined in delegating to the General Government the right to 'regulate commerce with foreign nations, and among the several States.' Whatever, therefore may have been their rights in the navigation of the Savannah River before they entered the Union, either as between themselves or against others, they both agreed that Congress might thereafter do everything which is within the power thus delegated. That the power to regulate interstate commerce, and commerce with foreign nations, conferred upon Congress by the Constitution extends to the control of navigable rivers between States, rivers that are accessible from other States, at least to the extent of improving their navigability, has not been questioned during the argument, nor could it be with any show of reason. From an early period in the history of the Government, it has been so understood and determined. Prior to the adoption of the Federal Constitution, the States of South Carolina and Georgia together had complete dominion over the navigation of the Savannah River. By mutual agreement, they might have regulated it as they pleased. It was in their power to prescribe, not merely on what conditions commerce might be conducted upon the stream, but also how the river might be navigated, and whether it might be navigated at all. They could have determined that all vessels passing up and down the stream should pursue a defined course, and that they should pass along one channel rather than another, where there were two. They had plenary authority to make improvements in the bed of the river, to divert the water from one channel to another, and to plant obstructions therein at their will. This will not be denied; but the power to 'regulate commerce' conferred by the Constitution upon Congress, is that which previously existed in the States."

This case was referred to by the Court in *Missouri vs. Illinois*, 180 U. S. 208, wherein it was said:

"* * * South Carolina v. Georgia, 93 U. S. 4, 23 L. ed. 782, was a suit in equity brought in this court,

whereby the state of South Carolina sought an injunction to restrain the state of Georgia, the United States Secretary of War, the Chief Engineer of the United States Army, their agents and subordinates, from obstructing the navigation of the Savannah River, in violation of an alleged compact subsisting between the states of South Carolina and (228) Georgia, and which had been entered into on April 24, 1787. This court, not denying, but assuming, jurisdiction in the case, held that, by adopting the Federal Constitution, and thereby delegating to the general government the right to regulate commerce with foreign nations and among the several states, the compact between the two states in respect to the Savannah River ceased to operate, and that the acts complained of being done in pursuance of congressional authority, and designed to improve navigation, could not be deemed an illegal obstruction, and accordingly the special injunction previously granted was dissolved and the bill dismissed."

I feel, therefore, clear that neither the State of New Jersey nor the State of Pennsylvania can rightly object if the Federal Government, in the interest of navigation, should itself construct dams across the Delaware River between New Jersey and Pennsylvania. The compact of 1783, in so far as it stands in the way, necessarily must yield to the national power. I am of the opinion, however, that in so far as said compact is not inconsistent with the exercise of the power of the United States in the regulation of commerce, such compact still stands and is effective. By that I mean that no corporation or individual could be lawfully authorized by New Jersey or Pennsylvania to construct dams in the Delaware River for the creation of water power without the consent of the other state and the United States, and I think this would be true whether there was any compact or not. Indeed, in *South Carolina v. Georgia*, supra, this Court, in the opening sentence of its opinion, said:

"We do not perceive that, in this suit, the State of South Carolina stands in any better position than that

which she would occupy if the compact of 1787 between herself and Georgia had never been made."

That the consent of both New Jersey and Pennsylvania would be needed for the construction of any dam across the Delaware River between those states is illustrated by the decision of the Court in *International Bridge Co. v. New York*, 254 U. S. 126. This was a suit brought by the State of New York to recover penalties from a bridge company for its failure to place, as required by the State statute, a roadway for vehicles and a pathway for pedestrians on a bridge between the New York mainland and Squaw Island in Niagara River. The bridge company defended upon the ground that this was an international bridge between New York State and Canada, that the bridge was devoted entirely to international commerce and had been authorized by an Act of Congress, and that Congress had thus assumed such control over the bridge as to prevent any intermeddling by New York State. The proof showed that the part of the bridge, with which the case is concerned, lay entirely within the territory of New York. The Court held that the State of New York was to be considered as the source not only of the title to the land upon which the bridge was erected, but also of the right to erect and use a bridge upon it, and that the State legislation requiring a roadway and a pathway upon the part of the bridge within New York State was within the power of the legislature of the State of New York. Under the authority of the above decisions, I am of the opinion that in order for any company or individual to obtain lawful permission for the erection of dams in the navigable portions of the Delaware River, it is necessary that there should be obtained the consent of Congress and the consent of New Jersey and Pennsylvania where the dam extends from the New Jersey shore to the Pennsylvania shore and the consent of the States of New York and Pennsylvania where the dam extends from the New York shore to the Pennsylvania shore, and that this is true whether or not there are com-

pacts between the two states on the opposite shores of the river.

Professor H. K. Barrows, a witness on behalf of the State of New Jersey, testified that it was feasible and practicable to construct dams in the Delaware River and some of the tributaries of the Delaware River so as to produce a minimum regulated horse power of 356,300 at the switch board, and of this horse power 190,400 would be developed by dams between New Jersey and Pennsylvania (Exhibits 104 and 105). The plan of Professor Barrows contemplates 29 dams, six of which are on tributaries of the Delaware River, wholly in New York State, two of which are on tributaries of the Delaware River, wholly in Pennsylvania, ten of which are across the Delaware River between New York and Pennsylvania and eleven of which are across the Delaware River between New Jersey and Pennsylvania. He further testified that the power developed by these 29 dams could be successfully operated only by one company, or by several companies acting in unison, or in any event, all the horse power developed by the 29 dams being used as part of a unified system. He also testified as to the costs of these dams, going into that feature in great detail, and the expense of creating power, and reached the conclusion that on the capital necessary to be invested there would be yielded a return of about 13 per cent, and that the proposition was, therefore, an economically sound one and a financially attractive one, but that the proposed diversion by New York City would materially affect the carrying out of this plan and would seriously impair the attractiveness of the proposition. That it is feasible to construct the dams as proposed by Professor Barrows and to develop the power, as testified by him, I think there is no doubt, but as to whether the proposition is a sound one from a financial standpoint is seriously contested. There is also a great conflict in the evidence as to the cost of the construction of the dams and the development of the power. However, on the presentation of this evidence, objection was made to it on the ground that there

was no present project for carrying out the plan of Professor Barrows and no permission from the Federal Government or from New Jersey, Pennsylvania or New York for carrying out said plan. In short, it is contended that there is no authorized project and that the plan of Professor Barrows is merely a plan on paper and an abstraction and that a court of equity will not grant injunctive relief against remote or theoretical damage but will only grant relief against immediate and proximate damage.

I find that while there has been a number of investigations as to the feasibility and practicability of constructing dams crossing the Delaware River for the purpose of developing power, yet there is no definite project of that kind at the present time. There is no power at the present time developed by dams across the Delaware River. No dams have been constructed across that river. There does not appear to be pending any petition or application to Congress or to the State of New Jersey, the Commonwealth of Pennsylvania or the State of New York for carrying out such a project. The proof indicates that the States of New York and Pennsylvania would probably not grant consent to any such project.

The whole matter seems to reduce itself substantially to this, to-wit, that there may be formulated at some time in the indefinite future a plan for constructing dams in the Delaware River and its tributaries to be operated as one whole system and, in the event this is done, and in the further event that Congress, the States of New York, New Jersey and Pennsylvania grant their consent, then in such event the carrying out of the New York plan would interfere with the execution of such project. It seems to me that this does not form a basis for injunctive relief. I think the principle is the same as that which was announced by the court in the case of *State of New York* vs. *State of Illinois*, 274 U. S. 488. A bill had been filed in that case to enjoin substantial diversions of water from Lake Michigan. The greater part of the bill proceeded on the theory

that the diversion would impair the navigable capacity of the Great Lakes and the rivers leading from one lake to another and then to the Atlantic Ocean. One paragraph of the bill, however, proceeded on the theory that the alleged diversion would interfere with the use of the waters of the St. Lawrence and Niagara Rivers by the State of New York and her citizens for the development of water power. In the opinion of the Court it is said:

> "But it does not show that there is any present use of the waters for such purposes which is being or will be disturbed; nor that there is any definite project for so using them which is being or will be affected. The waters are international and their use for developing power may require the assent of the Dominion of Canada and the United States. No consent of either is shown. The suit is one for an injunction, a form of relief which must rest on an actual or presently threatened interference with the rights of another. Plainly no basis for such relief is disclosed in what is said about water power development. At best, the paragraph does no more than present abstract questions respecting the right of the plaintiff state and her citizens to use the waters for such purposes in the indefinite future. We are not at liberty to consider abstract questions. New Jersey v. Sargent, 269 U. S. 329, 70 L. ed. 289, 46 Sup. Ct. Rep. 122. So the motion to strike out the paragraph must be sustained."

The question is also much the same as that involved in the case of *New Jersey* v. *Sargent*, 269 U. S. 328. In that case this Court said:

> "Passing that right, the state is merely shown to be contemplating power development and water conservation in the future. There is no showing that it has determined on or is about to proceed with any definite project."

Such a showing was held to be too indefinite and remote as the basis for an injunction.

I am of the opinion, therefore, that on the showing made in this case there is no basis for injunctive relief on the

ground that the proposed diversion of the City of New York would interfere with developmentby New Jersey or her citizens of water power on the Delaware River. I do not exclude from the record in the case the evidence of New Jersey as to the possible development of water power, though I think this might properly be done; I am content merely to hold that the showing made by New Jersey in this regard does not form any basis for injunctive relief.

I may add that while Professor Barrows was sustained in his evidence by other engineers of high standing as to the feasibility, practicability and financial soundness of developing water power on the Delaware River, yet there was equally strong evidence to the contrary. Indeed, Mr. George A. Orrok, an engineer of high standing, testified that he had on a number of occasions investigated the Delaware River as a source of water power, his investigations being made on behalf of the New York Edison Company, and that he had reported against such development. It appears from the record that Mr. Orrok made such investigations in 1908, 1912, 1915, 1919 and 1925. Mr. Orrok also controverted the evidence of Professor Barrows and other witnesses of the plaintiff as to the cost of water power development, the price at which power could be sold and the financial attractiveness of water power development. Weighing all of the mass of evidence, I am not convinced (even conceding the consent of the United States, New York, New Jersey and Pennsylvania could be obtained), that the development of water power in the Delaware River and its tributaries as proposed in Plaintiff's Exhibits 104 and 105, though capable of being constructed from an engineering standpoint, would be financially remunerative.

XI.

SANITATION.

Paragraphs 23 and 24 of the bill of complaint are as follows:

"23. Within the drainage basin tributary to the fresh water portion of Delaware River above but not including the City of Trenton, there is a population exceeding 700,000. The greater portion of this population is located in municipalities and large communities on or closely adjacent to the Delaware River or its principal tributaries. The sewage and industrial wastes from these cities and communities is discharged, either directly or after treatment and purification, into the Delaware River and its tributaries. This sewage, together with industrial wastes of industries and the natural surface drainage, produced certain unavoidable and irremediable pollution of the stream. There is a permanent population in the region tributary to the Delaware River in the State of New York exceeding 80,000 and this is greatly augumented by a large summer population, particularly in the vicinity of the villages of Liberty and Monticello, N. Y., consisting mainly of residents of New York City. The natural drainage from the summer resort region enters the Delaware River and its tributaries, particularly Mongaup and Neversink Rivers. In order to provide sufficient oxygen and dilution to permit the use of the waters of the Delaware River for domestic, potable, commercial, industrial, navigation and other purposes within the state of New Jersey, it is necessary that the Delaware River shall receive at Tri-State Rock the full, undiminished flow from the less polluted tributaries, including the East and West Branches of the main stream, the Beaverkill and Willowemoc and Little Delaware Rivers, and that the pollution of the Neversink or other tributaries shall not be increased in concentration by the diversion of a portion of the waters therefrom."

"24. The undiminished and unobstructed flow of the Delaware River at all normal and flood stages, and of all of the tributaries thereof are necessary for the dilution of said pollution and for purging said river,

for the purposes aforesaid. A diminution or obstruction of the flow at any normal or flood stage, as proposed by said City, will prevent such dilution and purging and will inflict great and irreparable injury upon, and destruction of the property and legal rights of, the plaintiff and its citizens, and deprive them of their ancient common law right as riparian proprietors to the use and enjoyment of the waters of said river for the several purposes herein mentioned and will injure, destroy and impair the property and prosperity of the plaintiff and its citizens, and prejudice and menace the health of its inhabitants."

There was a large volume of proof, much of it highly techincal in character, relative to the effect of the proposed New York diversion upon the sanitary condition of the Delaware River. Among the sanitary experts testifying were Dr. Willem Rudolfs, Professor of Water Supply and Sewage Disposal at Rutgers University, and Mr. Abel Wolman, a sanitary engineer of Baltimore, Maryland, who testified on behalf of the State of New Jersey; Mr. Harrison P. Eddy, a sanitary engineer of Boston, Massachusetts, who testified on behalf of the City of New York and Mr. Robert Spurr Weston, a sanitary engineer of Boston, Massachusetts, who testified on behalf of the Commonwealth of Pennsylvania. All these witnesses are of high character and standing and are eminently qualified to testify as to the effect of the New York diversion upon the sanitary condition of the Delaware River.

The State of New Jersey caused a sanitary survey to be made of the Delaware River watershed in the State of New York in the summer and fall of 1929. This survey was made by Mr. Leon G. Williams, a sanitary engineer and a member of the firm of Pearse, Greeley & Hanson of Chicago. This survey was made in cooperation with the firm of Whitman, Requardt & Smith of Baltimore and Prof. Willem Rudolfs. Sewage treatment plants were found at four places, Liberty, Monticello, Stamford and Hobart, though all of these plants were not found to be working with efficiency. At a number of places raw, untreated sew-

age was found to be discharged direct into tributaries of the Delaware River and sludge deposits were noted at a number of points. Several milk plants were also found discharging waste into the Delaware River and its tributaries, and, likewise, silk plants, and particularly one at Port Jervis, were found discharging industrial waste into the river. On the West Branch a slaughter house was also discharging waste into a septic tank which in turn emptied into the West Branch of the Delaware River. The effluent from this tank contained considerable pollution. There was also found some effluent from acid plants, which was discharged into the West Branch of the Delaware. The town of Port Jervis, in the State of New York and at a point where the Delaware River enters New Jersey, discharges raw sewage and industrial waste into the Delaware River and the Neversink River, with the result that the Delaware River, immediately below Tri-State Rock, was found to be in a highly polluted condition.

In this survey of the New York watershed of the Delaware River it was estimated that there was approximately a permanent population of eighty-five thousand and an additional summer population of about one hundred sixty thousand. In this estimate all of the watershed below the dams proposed by the City of New York was included.

Much of the pollution of the tributaries of the Delaware River in New York State is far removed from the northern boundary of New Jersey, some polluting sources being one hundred miles by river from Port Jervis. The Delaware River and its tributaries constitute a succession of rapids and pools and, by reason of these rapids, the water is stirred from top to bottom and is subjected to very great aeration and also to the effect of sunlight. The result is that the river and its tributaries have great power of self-purification. This is indicated by Exhibit 200, prepared under the direction of Professor Rudolfs, Major Whitman and Mr. Wolman. This exhibit shows that, notwithstanding the pollution of the Delaware River and its tributaries

above Port Jervis, New York, yet when the Delaware River reaches Sparrow Bush, which is about five miles above Port Jervis, the river has purified itself to the extent that the average of B.-coli per cubic centimeter is only 12.5. At Port Jervis, New York, however, which is on the New Jersey boundary line, there is very considerable pollution, both by reason of sewage discharge direct into the Delaware and Neversink rivers and also by reason of industrial waste, and the result is that at Tri-State Rock, immediately below Port Jervis and in the State of New Jersey, the average of B.-coli rises to 240 per cubic centimeter. As the stream flows southward the B.-coli rapidly die off, so that by the time the stream reaches Delaware Water Gap the B.-coli are reduced to 54.5 per cubic centimeter, and by the time the stream reaches the intake of the Trenton water works the B.-coli are reduced to an average of 34.5 per cubic centimeter. I set out here a compilation taken from Exhibit 200:

	Station	Average B. Coli per c. c.	Approximate Distances in Miles Above Trenton
A	Sparrow Bush	12.5	125
B	Delaware River, Tri-State	240.0	119
C	Neversink River, Tri-State	114.0	..
D	Dingman's Ferry	44.0	103
E	Water Gap	54.5	77
F	Belvidere	20.0	63
G	Above Easton	50.5	50
H	In Lehigh River near where it enters the Delaware	231.5	49
I	Below Phillipsburg, Easton and the Lehigh	292.0	47
J	Byram Bridge	68.5	25
K	Trenton, Calhoun Street Bridge	34.5	..
L	Below Trenton	946.0	..
M	Gloucester	2,690.0	..

This exhibit shows the great power of self-purification of the Delaware River as indicated by the decrease of B.-coli from Tri-State Rock to Delaware Water Gap. However, pollution is added to the stream below Tri-State Rock by various communities on the Pennsylvania and New Jer-

sey shores. But the river is capable under present conditions of caring for this pollution, so that when the water reaches Trenton it is suitable for municipal water supply. Below Trenton there is a large increase in B.-coli, and at Gloucester Point, below Philadelphia, Penn., and Camden, New Jersey, the river shows its maximum pollution.

The evidence of the New Jersey experts is to the effect that the New York diversion will be injurious to the sanitary condition of the waters of the Delaware River. The evidence of the experts on behalf of New York City and the Commonwealth of Pennsylvania is to the effect that the sanitary condition of the Delaware River will be slightly worse during high floods and moderate flows, but that the sanitary condition of the river will be improved at low flows, by reason of accession of waters from releases contemplated under the New York plan of releases and also under the Pennsylvania plan of releases. Tests of the sanitary condition of the Delaware River were made by Dr. Rudolfs in 1929 from July 5th to September 9th. Samples of the water were taken every other day, one sample being taken in the center of the stream, one near the left bank and one near the right bank. The sampling stations of Dr. Rudolfs extended from Sparrow Bush, above Tri-State Rock, to Gloucester Point below Philadelphia. The result of these tests is set out on blue prints in terms of number of B. coli per cubic centimeter, in terms of dissolved oxygen and in terms of bio-chemical oxygen demand. These are the usual tests adopted by sanitary engineers. Biochemical oxygen demand indicates the amount of oxygen which is consumed by impure water in a given time at a definite temperature, due to the oxidation of the material in the water. The dissolved oxygen represents the quantity of atmospheric oxygen which is physically present in a given amount of water at a given temperature and at a given atmospheric pressure. The bacillus coli originates in the intestinal tract and is always associated with disease bearing organisms, such as typhoid fever bacilli. The

number of B.-coli in a given quantity of water is an indication of the sanitary condition of the water.

Undoubtedly the pollution of the Delaware River at Tri-State Rock is nearly altogether due to the discharge by the town of Port Jervis of its raw sewage and its industrial waste into the Delaware and Neversink rivers, and makes the condition of the river at and immediately below Tri-State Rock one which is not only unsafe for domestic and municipal supply but also unsafe for bathing. However, as already stated, this pollution immediately below Tri-State Rock disappears substantially by the time the water reaches Delaware Water Gap. The experts are agreed that most of the B.-coli which are in the river below Tri-State Rock die before reaching Delaware Water Gap, forty miles below. Indeed, Mr. Wolman, a witness for New Jersey, stated:

> "I would say that on the basis of the 1929 records my prediction would be that virtually none of the Port Jervis organisms would reach Trenton or would reach Easton, might, perhaps reach, in a small residual amount, Delaware Water Gap." (p. 2478, Vol. 14.)

Mr. Wolman gave his opinion to the effect of the New York diversion as follows (pp. 2472-4):

> "Q. Under the plan of diversion proposed by the City of New York is it your opinion that the quality of the Delaware River at Tri-State Rock will be changed by that plan?
>
> A. I would answer that in two ways, Mr. Minard. First, from the volumetric standpoint: that is a pure question as to the abstraction or delivery of water as a result of the plan; and, second, as to its possible effect on the B. coli content at various points along the recreational area. By and large it is my judgment that the New York plan as they propose it will result in disadvantage to the recreational area from the volumetric standpoint for two reasons: one, that the number of times and the amount of release which they propose—and I have restricted myself rigidly to the months that they propose, July, August, September

and October, and have not included the month of June —the number of releases and the amount of release which they propose to my mind will not improve the present character of the stream to any appreciable degree; whereas the amount of diversion which I gather from the exhibits already presented during those same summer months, during a considerable part of the past experience which was available to me in the hydraulic records, will appreciably decrease the available dilution water.

In addition to that, a second volumetric disadvantage to me would be that increasing the very low flows of a stream by a small amount, even though that small amount is equalized, would not be as advantageous from a sanitary standpoint as leaving the low natural flow of the stream with its natural variations and possible increases from time to time. In other words, if I were offered a choice of the two plans, both having the same average flow in the summer, for argument, perhaps 0.45 c. f. s., I would choose that particular flow which showed the greatest variation to give that same average of 0.45."

He also said (p. 2475):

"Q. Do you attribute any value to the high water, the ice freshets and the others in the spring, from the standpoint of recreation?

A. In the recreational area, as familiar as I am with it, I should not be prepared to state that I would attribute a great deal of value to it, because I am assuming that during the winter period the accumulations which I have heard mentioned are probably not of ordinary domestic sewage origin, but they may help for the flushing out value. I am not prepared really to give them any considerable value.

I should like, Mr. Minard, if I may, to indicate, perhaps quantitatively, from the existing exhibits, why I arrive at the conclusion that the diversion plan will when it gives an advantage be slight and when it gives a disadvantage be of greater character.

On the record from 1913 to 1929 for the four summer months, defined as July, August, September and October, there would be an increase in those 66 months

of about 14 of the 66, roughly, 21 per cent in the 17 years. That increase on no occasion at that point gives over 149 total c. f. s. The remaining 79 or 80 per cent of those summer months showed decreases."

* * *

In describing the effect of New York diversion on the sanitary condition of the Delaware River, Dr. Rudolfs said (p. 2027-9):

"Q. Can you say whether the high-water periods of the year are a benefit to that river?

A. You mean the high-water periods in the summer, or throughout the year?

Q. In the spring and fall first.

A. In the spring the freshets coming down—I understand it is technically not correct to talk about 'flood flows'; you have to talk about 'freshets,' so I will use the same term—the freshets coming down have of course, a tendency in the spring to clean the river if there are sludge deposits or polluting matter deposits. Mr. Williams yesterday stated that he had seen sludge deposits around sewer outlets above Tri-State Rock, and naturally such deposits would be flushed out and scoured out in the spring-time, and also with freshets during the summer-time, and in the summer-time especially I think they have great value for that purpose.

Q. Will those high-water periods or freshets occur under the New York Diversion Plan?

A. If I understand the charts correctly—and I have studied them a good deal—the freshets will be cut down, or the tops lopped off to a large extent, and in the summer-time the same thing will happen to perhaps a relatively larger extent. So the result would be that the intensity of pollution during the season, would increase, and specifically perhaps the first month —first we start, under the New York Plan, with a poor condition, and then in June the amount of water returned, I believe, is not the same quantity, and the condition of the river would gradually become poorer; then you would be deprived of the freshets, so that the condition of the river would be seriously impaired. Taking into consideration that the condition of the

river at present is already in a precarious condition, or heavily polluted at the State Line, I have no doubt that the effect would be serious if diversion took place."

And as to the number of B.-coli per cubic centimeter permissible in water taken from the river for municipal water supply, Dr. Rudolfs said (p. 2364):

"The Special Master. I would like to get that figure in my mind. If there are 50 B. coli per c. c., that is a proper source for water supply, provided it is filtered and coagulated and treated?

The Witness. Yes; provided it is well treated."

And in regard to his observations on canoe trips on the Delaware River, Dr. Rudolfs said (6964-5):

"Q. What did you say the flow at Port Jervis was when you started on this canoe trip, something like 1500?

A. It was 0.5 c. s. m.

Q. The recreational period was on when you went down the river?

A. Yes, sir.

Q. And there were boating and swimming?

A. Yes, sir.

Q. Was the sanitary condition of the river good for bathing?

A. In most places, except in stretches along the river where you had that slimy material which people do not like and which made the conditions less good; but, otherwise, in a general way, up to Easton the river was in fairly good condition.

Q. You mean down to Easton?

A. From Port Jervis down to Easton.

Q. Dr. Rudolfs, assuming that there is a flow of 1000 c. f. s. at Port Jervis, I gather from what you stated that a reduction of that flow by 10 or 20 per cent would be a serious matter, so far as the sanitary condition of the river below is concerned?

A. Yes, sir.

Q. If the flow instead of being 1000 should be 10,000 c. f. s., would a reduction of that flow by 10 or 15 per cent be a serious matter?

A. It is relatively less important.
Q. Less important at the higher flows?
A. Yes, sir."

Mr. Eddy, in testifying for the City of New York, said (p. 4828):

"A. The river is a large river—that is, it has a large discharge, which gives it capacity to assimilate without detrimental effect a quantity of polluting matter which would cause objectionable conditions in a small stream. There are irregularities in the slope of the bed which cause a succession of rapids and pools, most of the latter being relatively shallow. There are no artificial dams across the river, although there are a few wing-dams. The banks are steep and much of the bed is stony, indicating swift currents. The river is wide and of varying depth but on the whole is comparatively shallow. These physical features assure a turbulent flow over a considerable portion of its course, a thorough and frequent mixing of the water from top to bottom, and a large and effective exposure to air, light, and the direct rays of the sun. Such conditions are unusually (4829) favorable for re-aeration and the maintenance of satisfactory sanitary conditions.

It may be added that the Delaware is a long river and the time required for the water to flow from many of the tributaries and upper reaches of the river provides opportunity for the dying out of disease-producing organisms, thus affording an important measure of self-purification with respect to such organisms. These comments apply especially to the portion of the river upstream from Trenton Falls. Below the Falls in the tidal section the water is deeper and the river is not so turbulent."

Mr. Eddy further testified, on being asked as to what change in sanitary conditions would result from the New York plan, as follows (pages 4837, et seq.):

"A. Well, there is a reduction in flow. There would be some incresae in concentration of pollution. That concentration would be greater during the cooler portion of the year, and whenever it occurs there would

be a relatively large flow in the river. In the cooler season the effect of the pollution is practically nil, because, first, the biological action in the water is greatly retarded by the lower temperatures, and, second, because the cool water contains a large quantity of dissolved oxygen. These two conditions tend to prevent an unfavorable effect of the polluting matter.

"In the warm season biological action is greater and the water cannot dissolve as much oxygen as at the higher temperatures. The critical times are those of very low flow, when there would be a decrease of concentration of pollution, because of the water let down from storage.

"During the four months season of 1929, within which analyses were made, Master's Exhibit 200, the flow would have been increased on 80 of the 123 days or two-thirds of the time. It would have been increased practically continuously from July 10th to September 14th, the most critical portion of that year.

"The analyses show that there was a quantity of dissolved oxygen at all points far in excess of the requirements of the organic matter, even without the assistance of reoxygenization which is available to increase greatly the supply of oxygen. The dissolved oxygen was nearly at the saturation point at Tri-State Rock. The average was 94 per cent. That was in hot weather in an unusually (4839) dry year. Of 25 Julys, twelve were drier than July, 1929, at Port Jervis; of 25 Augusts, 8 were drier than August, 1929; of 25 Septembers, 6 were drier than September, 1929. At Trenton of 17 Julys, 4 were drier, of 17 Augusts, 4 were drier, of 17 Septembers, 8 were drier than the corresponding months in 1929.

"The saturation varied at different points from here to Trenton, but throughout that distance the average did not fall to 90 per cent. This was notwithstanding a large increase in the organic pollution due to the increase in population resident in the lower drainage area. From Tri-State to Trenton the analyses show an increase of polluting matter of 40 per cent, and yet the dissolved oxygen at Trenton averaged higher than at Tri-State. These conditions illustrate the remarkable capacity of this river for self-purification and the maintenance of satisfactory sanitary conditions. These analyses furnish conclusive

evidence that any increase in concentration of polluting matter caused by the New York plan would be of no practical importance."

* * * * * * * *

(4842) "That portion of the river above Trenton Falls I have already described Below that point there is a great increase in pollution from the resident population, which I have shown to be much greater in density than that above Trenton Falls.

"The analyses at Gloucester Point, Plaintiff's Exhibit (4843) No. 200, show that the pollution at that point is much greater, and that the dissolved oxygen is much reduced. The average was about 26 per cent of saturation."

* * * * * * * *

(4844) "An important point is that the condition of the river down to Trenton Falls is such that the water carries practically its full normal proportion of dissolved oxygen, which shows that the water is in excellent condition from a sanitary point of view. There are, of course, variations in individual analyses, but taking it as a general proposition the river is in excellent condition to Trenton Falls. Below Trenton Falls the river is seriously polluted, and that is disclosed by the chemical analyses, particularly those at Gloucester Point which I have mentioned."

"By the SPECIAL MASTER:

"What is the explanation of the increase in pollution below Trenton Falls?

"A. The large resident population. For example, the City of Trenton has a large population; and the City of Philadelphia has a large population; and the the City of Camden. All of these cities contribute polluting matter. Even where the sewage is treated, as it is in a measure at Trenton, it carries a large quantity of polluting matter."

It was generally agreed by the expert witnesses that at the present time any water taken from the Delaware River for drinking purposes should be subjected to some kind of purification and, indeed, this is true at all points on the

river where municipalities take their water supply. The experts are also fairly well agreed that where the bacterial pollution of the river substantially exceeds fifty B. coli per cubic centimeter, it renders it more difficult to produce satisfactory drinking water.

In attempting to determine the effect of the proposed New York diversion, I quoted to Mr. Eddy a portion of the evidence of Mr. Wolman. The record shows as follows:

"By the Special Master:

Q. I read an excerpt from the testimony of Mr. Wolman, and I see on the following page he announces some conclusions in answer to two questions, and I think I should read them, for I don't want to be in the position of lifting anything from its connection. Of course, the testimony must be looked at as a whole. This is the question.

"I understand, then, you mean that whatever section, cross-section of the river you take, a diversion will injure that cross-section by concentrating the pollution content?

A. That is my answer, Mr. Minard. And the answer could be made if we assumed that Port Jervis were not in existence tomorrow morning, under the Plan."

A. (By Mr. Eddy) You ask if I agree with that?

Q. Yes.

A. In principle, yes. The concentration of (4925) pollution will be increased if you take water out. In my judgment, in this case as applied to the Delaware River under the New York plan, it is a purely academic question. The increase is immaterial from the practical point of view.

Q. Now, one further question was asked by Mr. Minard:

"Q. So that would apply at any place along the river? The diversion would affect it relatively injuriously?

A. That is my judgment. The importance of Port Jervis to me only is in the same sense that it starts at the state line at Tri-State Rock with

the water which bacteriologically I would define as unsafe for bathing purposes."

I suppose your answer would be the same to that?

A. My answer would be substantially the same, although I think this is true—and I have no doubt that Mr. Wolman would have said the same thing—that the further down stream you go, probably the effect of reduction in flow becomes less. That would be my testimony.

The Special Master: That is all, Mr. Eddy" (pp. 4924-5).

Mr. Eddy, on being asked the changes in sanitary conditions from a bacteriological standpoint, testified as follows (pp. 4845, et seq.):

"Q. What changes in sanitary conditions, from a bacteriological point of view, would result from the New York plan?

"A. In order to obtain a clear picture or conception of the New York plan, it is necessary to consider the river as a river of life as well as of water. The water contains living bodies from the size of a fish to every minute bacterium. These organisms are continually changing the organic material which finds its way into the water, and the organisms themselves are generated, growing and dying. Some of them, such as typhoid (4846) bacilli and B. coli, are considered not to increase in the water, but they do die off rapidly.

"For many years B. coli has served as an index to the sanitary condition of water, when considered from a bacterial point of view. That is, for water supplies or for bathing purposes, primarily. Polluted water, when used for municipal supplies, is treated to remove or destroy disease-producing organisms, and is judged in part by the number of index organisms, B. coli, present in the unpurified water and in the purified water respectively.

"Estimates of the limits of pollution which can be removed practically by treatment have sometimes been expressed as certain numbers of B. coli. Similarly, some have suggested certain numbers of these index organisms to indicate the limit of tolerance in pollution, in water to be used for bathing.

"Changes in the number of B. coli in the Delaware River due to the New York plan would be due to two causes—dilution and mortality. If dilution were the only agency, then B. coli would be changed in number in the direction opposite to the change in flow. That is, the greater the flow, the smaller the number of these bacteria. When I refer to dilution, I refer to the effect of the change in the volume of water upon the number of B. coli at any point. For example, if you have 1,000 B. coli with a (4847) given quantity of water, and you take out half of that water at that instant you will have twice as many B. coli per cubic centimeter in the modified water. That is what I mean by dilution.

But mortality has an influence upon the number of B. coli present. The extent to which the bacteria die off between two points depends upon the time of flow between these two points. The net change in the B. coli is the result of the change due to dilution, or the change in the volume of flow, and to mortality.

* * * * * * * *

(4848) The effect of the New York plan would vary according to the amount of reduction or increase in flow which results. When the flow of Fish's Eddy at other seasons than July, August, September and October is below 0.45 second feet per square mile, then there will be an increase in flow due to the New York plan. And in the summer time, July, August, September and October, there will be an increase in flow when the flow at Fish's Eddy is below 0.45 second feet per square mile. The reduction in flow will be accompanied by an increase in time of flow. The water will not run so swiftly. That increase will permit a larger proportion of the B. coli or disease-producing organisms, such as typhoid bacilli, to die off in transit.

(4849) It is probable that the decrease, due to mortality, will seldom, if ever, entirely offset the increase due to reduction or increase in flow; but the tendency will be in that direction, and at some of the more usual rates of flow the change in number of B. coli due to change in flow will be much reduced by mortality effect.

* * * * * * * *

Making allowance for the effect of mortality, I estimate that the net effect of the New York plan upon the

number of B. coli will be a decrease during that portion of the summer months when there will be an increase of flow. During that portion of the summer when there will be a decrease in flow, there will be an increase of about 5.5 per cent in B. coli in Trenton; during the remainder of the year, for eight months an increase of about 9 per cent at Trenton; and during that portion of the summer season when there will be a decrease in flow there will be an increase in B. coli of about 9 per cent at Tri-State.

It follows, then, that the increase in B. coli due to the New York plan in that portion of the summer when the flow will be decreased will vary from somewhere in the neighborhood of 9 per cent at Tri-State to around 5 or 5.5 per cent at Trenton.

Q. Will the changes in sanitary conditions resulting from the New York plan affect the suitability of the river for a municipal water supply?

A. In the preceding answer I have emphasized and dealt with the bacterial considerations. In answering this and the two succeeding questions I have in mind not only the B. coli, which we use as a convenient yard stick, but the general considerations. B. coli is a very useful means of measuring, but there are conditions under which the actual numbers are not controlling. In other words, it is necessary to take into account all of the conditions which surround the problem. Under the present conditions, while the river is relatively pure for a large stream, the water in the main river is not suitable for municipal water supply (4851) without thorough purification. The changes in quality which will result from the New York plan, if put into effect, will not increase the need for or the difficulty in purification of the water for a municipal supply.

Q. Will the changes in sanitary conditions resulting from the New York plan be detrimental to the use of the river for main drainage purposes?

A. The capacity of a river or the capability of a river for satisfactory service as a main drainage agency is determined by its capacity or capability for satisfactory disposal of the liquid wastes from and affected by the resident population within the drainage area.

During low flows in hot weather these are the critical conditions; that is, low flow and hot weather; if

a river can function satisfactorily under such conditinos there is no danger of failure at other times. As the New York plan provides for increasing the flow under such conditions, the capacity of the river will be increased and the result of the plan will be an improvement.

Q. How will the changes in sanitary conditions resulting from the New York plan affect the suitability (4852) of the river for recreational purposes?

A. The conditions will not be changed sufficiently to affect the suitability of the river for recreational purposes.

Q. What do you say relative to the standard for bathing waters?

A. There is no generally accepted standard for bathing waters. Some B. coli counts have been suggested, and I have used B. coli as a yardstick in judging of the suitability of particular waters used for bathing. Where untreated sewage enters a river in such a way as to reach the bathing waters while the bacteria are in virulent form it is obvious that there is potential danger to the bather. In such a case fixing any number as a standard might lead to a sense of false security.

Again, when the contamination comes from practically unpolluted areas, a higher number of B. coli, which we sometimes find under such conditions, might not indicate a dangerous water. Each case must be judged on its own local conditions. I have no doubt that there is an element of danger in bathing anywhere in the Delaware river. This danger will not be increased by the New York plan."

Mr. Weston, a sanitary expert for Pennsylvania, testified as follows (p. 6377):

"Q. Do you agree or disagree with Dr. Eddy's conclusions regarding the effect of increases in the summer flow of the Delaware River through compensation waters let down from the New York reservoirs?

"A. Yes.

"Q. And what would be that effect?

"A. The net effect of the New York plan upon the numers of B. coli would be a decrease in numbers, due to released water.

"Q. What will be the effect of taking the water and the release of water under the Pennsylvania plan by all three States?

(6378.) "A. The effect would be similar, although it would vary in degree. The Pennsylvania plan of impounding and releases would provide more compensation water than the New York plan of impounding and releases at times of low flow in the Delaware River, when the releases are most needed."

Again at p. 6384 he said:

Q. Will the present sanitary conditions of the Delaware River as shown by Dr. Siebert's survey be harmed or helped by the releasings under the New York plan?

A. The New York plan would help conditions during periods of release. It would slightly deteriorate conditions where appreciable takings were made.

Q. How about the Pennsylvania plan of impounding and releasing; would that harm or affect the present sanitary conditions?

A. It would harm the present sanitary (6835) conditions to a lesser degree during the periods of low flow and slightly more during periods of high flow.

Q. How will sanitary conditions be helped under either plan, or both plans?

A. In the first place, the summer flows would be more uniform, which would favor the establishment of biological conditions antagonistic to B. coli and the bacteria of water-borne diseases.

Again, the increases in numbers of B. coli, due to moderately high flows with their attendant scouring of polluting deposits, would be minimized. It is better to have these deposits digest slowly, as they would with the stream better controlled, and not be disturbed every time the stream reaches a scouring velocity.

Again, the purgative effect of extremely high flows would not be prevented by takings under any plan, because at these times the reservoirs would be full and the water would flow over their spillways.

The purgative value of extreme floods has not been definitely proved from a sanitary standpoint. Floods scour the whole catchment area, as well as (6386) the river bed, and the deposits of sand and silt borne by

the river may or may not be beneficial from a sanitary standpoint. These high floods are not necessary for the removal of the lighter deposits of sludge in the vicinity of sewer outfalls; for it must be remembered that stream velocities of slightly more than four feet per second will wear away hard clay deposits. With all the sewage now discharged to the river treated, no deposits of sludge would occur at sewer outlets or near them.

Still further at p. 6415 he testified:

Q. In conclusion, Mr. Weston, what will be the effect on sanitary conditions of the Delaware River when New York is taking 600 million gallons of water daily but is impounding and releasing waters in accordance with the so-called Pennsylvania principle?

A. The effect would be to improve the sanitary conditions at critical periods. It would have no appreciable effect upon sanitary conditions during periods of high flows in winter months when conditions are not critical. It would (6416) decrease the density of pollution at critical times and in all events the changes produced by takings and releases would be far less than the ordinary meteorological changes from year to year or sometimes even less than those from month to month.

Q. Briefly, what will be the effect on the sanitary conditions of the Delaware River when all three states are taking, impounding and releasing waters in accordance with the Pennsylvania plan?

A. The effect would be similar to that under the New York taking and the Pennsylvania plan. If anything, the changes in conditions would be less, especially in the non-tidal portion of the river, assuming, of course, that such changes were determinable there.

There was also much evidence from non-expert witnesses tending to show that there was a purging effect in the freshet flows of the Delaware River and that this was generally beneficial to the sanitary condition of the river. There was also evidence to the effect that freshets had the effect of scouring the countryside and increasing the number of B. coli and pollution in the stream. I think all of the witnesses, however, are fairly well agreed that the crit-

ical period in the Delaware River, so far as sanitation is concerned, is during the hot summer months and that there is little or no danger from an insanitary condition during the winter months. Generally speaking, the winter months are the months of high flows and the summer months are the months of low flows. During the very low flows, undoubtedly, the condition of the river will generally be improved by releases whether under the New York or Pennsylvania plan, and during very high flows and moderate flows the condition of the river will be made slightly worse by the abstraction of water under the New York plan.

On the whole, I am of the opinion and so find that the operation of the New York plan will impair to some extent, though not greatly, the sanitary condition of the Delaware River. I am further of the opinion, however, and so find, that this impairment can be eliminated by requiring sewage treatment at Port Jervis and by changing the amount of water taken by New York City and by changing the plan of release of water, as will hereinafter be set forth.

The record in this case is replete with exhibits prepared by sanitary experts but I think no useful purpose would be subserved by attempting to review these exhibits. I am merely stating, therefore, the general result of these exhibits and the probative effect of the evidence of the witnesses upon my mind after careful attention to this evidence and a careful reading and re-reading of all the evidence on the point of sanitation.

XII.

MUNICIPAL WATER SUPPLY.

This subject has already been discussed to a considerable extent under the heading "Sanitation."

I am unable to find that the New York diversion will have any serious effect so far as municipal water supply is concerned. On the New Jersey side of the river Tren-

ton, Burlington, Phillipsburg and perhaps other municipalities take water for municipal and domestic purposes from the Delaware River. On the Pennsylvania side, Philadelphia takes sixty per cent of its supply from the Delaware River and Chester also takes its supply. It is necessary that all of this water, under existing conditions, should be filtered and purified before being delivered through pipes to the consumer. I am unable to find that the diversion by New York City will have any marked effect. It will at times increase the number of B. coli but only to a small extent. Indeed, on examining the record of the Trenton Water Works, it appears that nearly all the shut-downs have been due to freshets and extremely high flows, which brought down a large quantity of polluting matter. Of the 29 shut downs from 1915 to 1929, inclusive, 25 are ascribed by the records of the water works department of the City of Trenton to freshets and continuous high water. I am of the opinion that if the defendants should be required to treat the sewage and industrial wastes of Port Jervis so as to deliver the water of the Delaware River to New Jersey in a relatively clean condition, and if the defendant city should also be required to reduce its taking of water and to increase its releases, there will be no harmful effect resulting to New Jersey municipalities by reason of the carrying out of the New York plan (as modified in this report).

I think it is the duty of New York to see to it that the Delaware River, when it leaves New York and flows into New Jersey, shall be in a relatively clean condition. After the waters of the Delaware River leave New York State, it is then the problem of Pennsylvania and New Jersey to see to it that the waters of the river are not unduly polluted from sources on the New Jersey side and the Pennsylvania side. All three states have laws relative to preserving the sanitary condition of their waters and the State of Pennsylvania in particular, through the commendable efforts of Mr. W. L. Stevenson, Chief Engineer of the

Pennsylvania Department of Health, has entered into agreements with the Departments of Health of New York and New Jersey for preserving the Delaware River in a sanitary condition. Copies of these agreements are made exhibits. The agreements provide for a high degree of treatment of sewage before it is discharged into the Delaware River above Easton, Pennsylvania, and Phillipsburg, New Jersey and provide for a sedimentation of sewage before it is discharged into the river below said points. The agreement between the Department of Health of Pennsylvania and the Department of Health of New York also erects a uniform standard for high treatment of sewage and for treatment to a qualified degree of industrial wastes prior to discharge in the Delaware River above Tri-State Rock. Mr. Stevenson testified that these agreements had been fruitful of good results.

Any pollution of the Delaware River by the States of New Jersey and Pennsylvania below Tri-State Rock is beyond the scope of any relief prayed for in the bill of complaint. However, from the evidence in the case I find that there is an effort on the part of all three states to require the treatment of sewage and industrial wastes so as to preserve the sanitary condition of the Delaware river, and these efforts are progressive and may be expected still further to reduce pollution of the stream, but there remains much yet to be done in that regard.

The Commonwealth of Pennsylvania at present takes much more water from the Delaware river for municipal water supply than does the State of New Jersey, yet Pennsylvania makes no objection to the New York diversion.

Mr. Weston, a witness for Pennsylvania (who had made a study of the purification of Delaware river water for his client, the Chester Water Service Company), testified that the effect of the New York diversion would be inappreciable.

On consideration of the whole evidence on the effect of the New York diversion on municipal water supply of New

Jersey municipalities, I find that said diversion will adversely affect to a very small degree, but not substantially, Delaware river waters as a source of municipal water supply.

I further find that said diversion, by reason of the lowering of the level of the Delaware river, will not have any marked or serious effect on the ability of New Jersey municipalities to take water from the river through the present intakes of such municipalities. It may entail a slight expense in lowering the sump at one point.

I further find that by decreasing the quantity of the New York diversion and by increasing the release of water from impounding reservoirs during low flows in the river, and by treatment of the sewage and industrial waste of Port Jervis, as hereinafter recommended, there will be no appreciably adverse effect on the waters of the Delaware river as a source of municipal water supply.

XIII.

INDUSTRIAL USES OF DELAWARE RIVER WATER.

In the bill of complaint, it is alleged that the proposed diversion of waters from the Delaware river will deprive the State of New Jersey and its citizens of water which they are entitled to have and use for "domestic, potable and industrial purposes." There is no specification in the bill of the industrial purposes, but I have treated the bill as if it had alleged all the industrial purposes which were made the subject of proof.

At the outset, it is to be observed that any effect of the New York diversion on the use of Delaware river waters for industrial purposes will be felt by Pennsylvania just as much or more than by New Jersey. Indeed, by reason of the numerous industrial enterprises in the City of Phila-

delphia and below Philadelphia to the State line, it is probable that industrial uses of Delaware river water are of much more interest to Pennsylvania than to New Jersey. The main witness for New Jersey on industrial uses of Delaware river water, and particularly the use of such water for boilers and condensers, was Mr. Sheppard T. Powell. Messrs. George A. Orrok, Allen Hazen and Weston E. Fuller testified on the same features of the case for the City of New York, and Mr. Robert Spurr Weston for the Commonwealth of Pennsylvania. Each of these witnesses is a sanitary, chemical or water supply engineer of high standing and extensive experience, and all were qualified to testify on the subject under consideration.

Mr. Powell had made tests of Delaware river water at Holland, New Jersey, where there is a large power plant. Holland is a short distance south of the point where the Lehigh River enters the Delaware River. He had also made tests in the tidal section of the Delaware River at the Deepwater power station, Deepwater, New Jersey. Mr. Powell stated that the effect of the New York diversion would be to increase the alkalinity and hardness of Delaware River water, and to increase phenols and sulphates in the water, and in the tidal section to increase the salinity of the water, and that the New York diversion would generally make the water less useful for industrial purposes and particularly less useful as boiler feed water and water for condensing purposes. Mr. Powell said: (R. 2173.)

"Q. Have you examined the stream flow charts in the volume exhibits of water that have been offered in this case?

A. Yes, sir.

Q. Are you in a position to express an opinion as to whether the diversion of water as proposed by the City of New York will affect the Delaware River and the use thereof from the standpoint of phenol?

A. Anything that reduces the fresh water entering the Delaware or passing in the Delaware—passing the point at Easton, will depreciate the water for steam-making uses and for industrial uses, due to the fact that the Lehigh River with its higher mineral content will depreciate the value of the water."

On being asked as to what element depreciated Delaware River water most for industrial purposes, Mr. Powell said: (R. 2177.)

"Q. In your exhibit No. 190, you have phenols, and you have an enumeration of seven elements in it. Which one of them do you consider the worst?

A. From the standpoint of the operation of steam boilers, it is not a question of the value of the water or any single constituent, but a combination of conditions which would depreciate the value of the water.

Q. Which one of those elements depreciates the value of the water the most?

A. At that particular type of station, and the type of treatment plant that we have there at the present time, which is very elaborate and which will take out the hardness and some of the other elements, I should say the worst constituent would be the phenols.

Q. What is the next one?

A. I should say the next one would probably be the hardness.

Q. And the next to that?

A. Possibly the hydrogenion and carbon dioxide. They are both tied up together. If they passed through the system, they would be highly detrimental, due to the fact that they would increase the corrosive properties of the water.

Q. The hydrogen ion is not something in the water, is it?

Oh, yes. It represents ionized hydrogen in the water. That test actually measures the hydrogen ion, or the amount of hydrogen ion in the water. It may be found also by breaking up the other constituents of the water. An acid has its acidic properties, due to the presence of hydrogen ion.

Q. Are the sulphates good for water?

A. No; they are very bad, and especially with high pressure boilers. That is the reason we put that elaborate system in, to get them out if we possibly can."

In regard to phenols, he stated that they came generally from gashouse waste.

He further stated in regard to the possibility of abstracting phenols from the water as follows: (R. 2183-2184.)

Q. If, however, the phenols are there and cannot be avoided, then is the situation improved any by removing the stream dilution?

A. It makes it worse if the dilution is removed.

MR. MINARD: That is all.

By the SPECIAL MASTER:

Q. At this Holland station of which you speak, have you some apparatus for removing these phenols?

A. They cannot be taken out very readily. There is is only one method I know of, and that is still experimental, in reference to taking them out.

Q. What was done at that station toward improving the water to be used?

A. We put in the most elaborate system we could find, and if there is any indication that the water becomes depreciated to the point where it causes damage, we will abandon that stream, and have already secured rights on other streams, and if that condition continues to get worse we will have to abandon that stream, by which I mean the Delaware. I am speaking now about the Delaware. We would have to abandon that and take another stream not so polluted.

And on the same subject he said: (R. 2185.)

Q. Do you know of any installation or operation of apparatus to remove the phenols?

A. There are two methods that have been tried experimentally. One is the use of ammonia, which would not be applicable, in my opinion, for the treatment of water at a high pressure station. The other is the potential possibility of removal of activated carbon, which would be very expensive, relatively so, and possibly not applicable for that type of plant.

He also stated that, regardless of the New York diversion, he had advised the company operating the Holland station that it might be necessary to obtain water from some source other than the Delaware. (R. 2186-2187).

The witness stated that he had also investigated the use of Delaware River water for industrial purposes at Paulsboro, New Jersey, and at Deepwater, New Jersey, and at other points. He said: (R. 2558-2560.)

> Q. Have you considered what effect the diversion of the Delaware River, as proposed by New York City, would have with respect to the hardness of the water?
>
> A. Yes, sir. It was indicated that as the flow is reduced, which would happen with a diversion, the hardness of the water would increase.
>
> Q. What effect would that have upon the cost of softening the water for boiler feed use?
>
> A. It would be proportionate to the increased hardness. I calculated that increase for a period from 1913 to September, 1929, and the increased cost of softening water per million gallons during that period had the diversion been in effect, would have been $26,788.
>
> By the SPECIAL MASTER:
>
> Q. During what period?
>
> A. October, 1913, through September, 1929.
>
> By MR. MINARD:
>
> Q. What is the unit of quantity there?
>
> A. Per million gallons of water treated in the water-softening system.
>
> Q. Does that apply to all the plants you have described?
>
> A. Not all the plants I have described. It does not apply to the Deepwater station. It does apply, however, to the Holland station and the Vacuum Oil Co. station.
>
> Q. Does it apply likewise to any other plants along the river that use the water for steam purposes?
>
> A. Yes, sir.
>
> Q. What would it mean in dollars and cents to the Vacuum Oil Co. plant?

A. It would mean practically $53,000 for that period.

Q. Is the method of softening water for boiler feed use the same as used in other industrial processes?

A. Yes, sir; it is used frequently.

Q. Would the increased cost of softening, as you have testified, be the same for softening water for industrial purposes?

A. Yes, sir.

In regard to the effect of the New York diversion on salinity in the tidal section of the river, the witness stated that he had made an investigation of the chloride content of Delaware River water at Deepwater, New Jersey, on various dates from May 24, 1929, to November 9, 1929. Deepwater, New Jersey, is near Pennsgrove, New Jersey, and not far distant from Wilmington, Delaware. He said: (R. 2561-2562.)

A. The chlorides are reported in parts per million. The figures range from 8.4 parts per million on May 24th, to a maximum on September 3rd of 856 parts per million.

THE SPECIAL MASTER: Per million cubic centimeters?

A. Parts per million. Pounds per million pounds.

THE SPECIAL MASTER: Pounds per million pounds?

A. Yes.

As to the effect of increasing the chloride content, he further said: (R. 2562-2563.)

Q. What effect will high chlorides have on power-house uses?

A. High chlorides in the water are detrimental for power uses, either for use in water as boiler feed water make-up, or for condensing water. If the condenser leaks—and it is very difficult to keep condensers absolutely tight—chlorides getting into the water will result in corrosion.

Q. Would the diversion of the river as proposed by New York tend to increase or decrease the chloride content at deepwater stations?

A. It would tend to increase it.

Q. Is there any ratio that you can give, or is it in proportion to the decrease of the water?

A. I don't know at what proportion it would increase, but it will increase, due to the fact that the fresher water is being removed.

THE SPECIAL MASTER: Is this fresh water or brackish water or salt water at Deepwater in New Jersey?

A. It is fresh water during the high flows, as in May, but it gradually becomes brackish during the low flows in the river, due to the backing up of salt water from the Bay. That is the influence of the backing up of salt water during low flows.

The general effect of the evidence of this witness is that the New York diversion will have a detrimental effect on the use of Delaware River water for industrial purposes by increasing the alkalinity and hardness of the water, and increasing sulphates and phenols in the water, and in the tidal section by increasing salinity.

There was much evidence to the contrary by witnesses for the City of New York and the Commonwealth of Pennsylvania. In the brief of the Commonwealth of Pennsylvania filed with me the following statement is made:

> "Because of the extensive and vast industrial interests of Philadelphia and Eastern Pennsylvania, this alleged injury was studied with the greatest of care by the Pennsylvania engineers. After an exhaustive study of all the facts, they decided that there will be no appreciable effect upon hardness and salinity under the Pennsylvania plan."

Robert Spurr Weston, a sanitary engineer testifying for Pennsylvania, stated that he had made a study of the use of Delaware River water for industrial purposes; and, after setting out the study which he had made and his sources of information, reached the conclusion that the effect of the New York diversion on the waters of the Delaware River for industrial purposes would be minimal, unimportant and inappreciable. He also stated that the effect of the diversion on the salinity of the tidal section of the Delaware River would be inappreciable. Mr. Weston said: (R. 6452-6455.)

Q. In conclusion, what will be the real effect when all three States take, upon sulphates in the Lower Delaware River?

A. Minimal and unimportant.

Q. And when New York alone is taking under either plan of impounding and release?

A. The same answer.

Q. How about other points along the river, such as Trenton and Holland?

A. The same answer.

Q. Assuming that all three States are taking water from the Delaware River under either the New York or the Pennsylvania plan of impounding and releasing, what will be the effect upon salinity in the Lower Delaware River?

A. No appreciable effect in the waters of the State of Pennsylvania.

Q. And does that answer apply equally well when New York alone is taking, under either plan of impounding and releasing, the New York or Pennsylvania plan?

A. Yes.

Q. In conclusion, Mr. Weston, what is your general opinion regarding the character of the Delaware River from the point of view of the sanitary engineer?

A. The upper tributaries of the Delaware in all three States are favorable sources of water supply which may be conserved indefinitely. The main river between Hancock and Trenton is a suitable source of raw water for supplying municipalities through modern water purification plants, for supplying industries, and by proper treatment of sewage and waste, it may be maintained in this condition indefinitely.

The Lower River is an inferior source of raw water supply except at certain points, and it is also highly polluted in places, notably between Frankford and Chester, along the Pennsylvania shore, and near the City of Camden along the New Jersey shore. In the Lower River treatment of sewage and wastes causing this pollution would greatly relieve the burden from purification plants, and temporarily reduce the pollution in the Lower River. Ultimately increasing population with its increased cost of sewage treatment will cause the abandonment of the Lower River as a source of water supply. It will still continue to be the main

drainage channel for the Valley municipalities, and as such may be used indefinitely and without nuisance.

Q. As a sanitary engineer, what policy would you recommend for the conservation of the Delaware River?

A. Those parts which are relatively unpolluted I would conserve in their present condition by every possible means. The main river above Trenton I would improve by increasing the degree of sewage treatment. The Lower River I would keep as clean as is practicable, so that it may still be used for industry and for the dilution of sewage effluents, without injury to industry and without nuisance even in the vicinity of the outfall from sewage treatment works.

George A. Orrok, after stating the investigations which he had made and his familiarity with the subject, stated his conclusions as follows: (R. 3852.)

A. In a general way the winter and spring flood flows will be reduced slightly and the low water flows in the summer months will be slightly increased. I believe, however, that no ordinary observer along the river below Port Jervis would be able to detect a difference, unless the stagnant periods in mid-summer may perhaps disappear. Systematic gagings in the upper river would undoubtedly show the change, but I should be surprised if it could be recognized either at Reiglesville or Trenton.

Q. And from your knowledge of the Delaware River, how, in your opinion, would the proposed plan of the City of New York affect the quality of the river water for boiler feed and condenser purposes below Easton, Pennsylvania?

A. It is my opinion that it would be impossible to detect any difference in the quality of the water for these purposes.

Mr. Allen Hazen, testifying for the City of New York, gave the following general statement as to the effect of the New York diversion: (R. 4943.)

Q. State what effect, in your judgment, this would have upon the water supplies now drawn from the

Delaware River that use the run of the streams and purify the water by filtration.

A. The effect upon water supply conditions of present water supplies would be very slight. Two changes may be noted corresponding to the two parts of the year classified according to the size of flows. In the dryest part of the year; that is, especially during the hottest and dryest weather, the summer conditions would be slightly improved by the added flow of the river and the increased dilution, of whatever impurities might be carried by it. During the remainder of the year, there would be a slight reduction in the dilution of impurities brought to the river. This would mean a slight increase in hardness and corresponding increases in any other foreign constituents. Both the increase and decrease would be so slight as to be hardly capable of being detected by methods of analysis now available. Any such changes would make no appreciable difference with the kind of a plant required to treat the Delaware water nor in the cost of treating it.

Mr. Weston E. Fuller, testifying for New York, summed up his conclusions as follows: (R. 5081-5082.)

Q. Did you hear the testimony given by Mr. Powell in regard to the effect of the taking of the water by New York on water used for boiler feed at the Holland station?

A. I did.

Q. Would the effect of the tkaing of this water be a serious one at that station?

A. No, it would not. The small percentage of water taken by the City of New York would be, I think, very difficult to detect, either in hardness or phenol content. Furthermore, the hardest water comes during the driest season of the year, at the time when New York City is letting down more water than would come without the taking. So that during the worst part of the year as far as boiler feed water is concerned, there would be an improvement rather than a detriment, although the effect of any diversion would be very minor indeed.

In this conflict of evidence between experts of high standing, I observe this outstanding fact and that is that the

critical time for the industrial use of water is during the extremely low flows and at such times there is an increase of flow under the New York or Pennsylvania plan of release and therefore an increase of fresh water for diluting foreign substances.

After a reading and study of all of the evidence (much of it technical in character) and the exhibits filed by the witnesses, I am of the opinion that the State of New Jersey has failed to establish by the probative weight of the evidence that the effect of the New York diversion will be to make the waters of the Delaware River substantially or materially worse for industrial purposes. Undoubtedly there will be times when there will be some impairment of the water for such purposes; also, there will be times, when, by increasing the flow of the river, there will be some improvement of the water for said purposes. On the whole, I am of the opinion, and so find, that the effect of the New York diversion will be to impair but slightly the use of the Delaware River water for industrial purposes; I further find that salinity conditions at any point on the Delaware River in the tidal section where the water is used for industrial purposes will also be adversely affected to only a slight degree.

I am further of the opinion, and so find, that by decreasing the quantity of the New York diversion and by increasing the quantity of water released during low flows, and by the treatment of sewage and industrial waste at Port Jervis, as hereinafter recommended, any damage to New Jersey or its citizens, in the use of Delaware River water for industrial purposes, will be inconsequential.

I am further of the opinion and find that much can yet be done by the States of Pennsylvania and New Jersey looking to the improvement of the Delaware River waters for industrial purposes by the adoption of more rigorous and extensive requirements for the treatment of sewage and industrial wastes reaching the Delaware River from points in New Jersey and Pennsylvania, though to accomplish this will probably require additional legislation in both states.

XIV.

RECREATION.

The bill of complaint alleges as follows:

> "31. The Delaware River above tidewater is renowned in art and literature for its scenic beauty and possesses valuable recreational advantages. Between the City of Phillipsburg, New Jersey, and Tri-State Rock these features are especially pronounced, including one of the natural scenic wonders of the United States, known as Delaware Water Gap. In this valley at the above Delaware Water Gap are located many large hotels, boarding houses, camps and country clubs, to which thousands of the citizens of the plaintiff and other states resort annually to enjoy the benefit of the scenery, boating, golfing, fishing and other form of recreation and pleasure. In these enterprises and facilities the citizens of the plaintiff and other states have invested millions of dollars and their prosperity and usefulness depend upon an adequate supply of water in the Delaware River during the summer months."

I find that the above allegations are sustained by the proof. Mr. Henry G. Hershfield, a qualified witness, made a survey of the 120 miles of river frontage between Trenton and Tri-State Rock and places a value upon the lands and improvements immediately upon the river which are used for pleasure and recreational purposes in the sum of over eleven million dollars. There can be no doubt that there is a very large investment in summer hotels, boarding houses, bungalows and camps on the shores of the Delaware River from Trenton northward to Tri-State Rock. It is a favorate place of resort during the summer months, particularly for camping, boating and bathing. Numerous camps for boys and girls are maintained.

The bill also alleges in paragraph 32, as follows:

> "32. The proposed diversion of waters from the tributaries of said river will substantially diminish the

flow of water in the Delaware River during the summer months and permanently and irreparably injure the property and vested rights of the plaintiff and its citizens and destroy the natural advantages of said valley as a health and recreational resort."

In this connection it should be remembered that the State of Pennsylvania, on the opposite bank of the Delaware River from New Jersey, is just as much interested in any damage to the Delaware River as the State of New Jersey and, if any damage is sustained, those damages will be borne by Pennsylvania to the same extent as New Jersey, with the exception of the damage to oyster beds. There are no oyster beds in Pennsylvania but there are extensive oyster beds in New Jersey. The pleasure and recreational activities and developments appear to be greater on the Pennsylvania shore than on the New Jersey shore.

The question, however, is whether the proposed diversion by the City of New York will adversely affect the river for recreational purposes. It is to be borne in mind that these recreational activities are confined largely to the summer months and generally extend from about the first of June to the 15th of of September, with the main activities during the months of July and August. The proof of New Jersey is that the carrying out of the New York plan will diminish the flow of the river, will increase the pollution of the river and will reduce freshets, which it is claimed are useful in purging the river and in scouring and cleaning the banks of the river. There is much evidence from lay witnesses, who have interests along the banks of the river, to the effect that at times when the river is very low there are objectionable odors and the river becomes unattractive for bathing purposes, but that these unfavorable conditions are removed by freshets.

The center of the recreational activities is in the vicinity of Delaware Water Gap, a place of rare scenic beauty. The evidence also shows a large number of motor boats and

canoes operated upon the river during the summer months, all for purposes of pleasure and recreation.

It is undoubtedly true that the river has an excellent reputation as a place for pleasure and recreational purposes and it would, of course, be very damaging to those who have made investments in summer hotels, boarding houses, bungalows and camps to have that reputation impaired. The evidence is highly conflicting as to the effect of the carrying out of the New York plan so far as the use of the Delaware River for recreational purposes is concerned. There was particularly a conflict as to the value of summer rises or freshets, some witnesses testifying that these freshets had great value in purifying the river and washing away sludge deposits from the banks, and other witnesses testifying that these summer freshets added polluting matter to the stream by reason of the scouring of the country side by rains and the bringing of polluting matter into the stream, and that during and immediately after these freshets the river was quite muddy and objectionable for bathing and boating. It is difficult and, indeed, impossible to harmonize all of this evidence. The most satisfactory deduction which I can draw is that a very high summer freshet, produced by sudden and heavy rainfall, does have the effect of washing into the stream from the watershed a great deal of polluting matter and does increase the turbidity of the stream, and for the time being injures the sanitary character of the water and at the same time renders the river more undesirable and dangerous for boating and bathing during the passage of the freshet, but after the passage of the freshet the condition of the river is improved. On the other hand, a moderate rise in the river, particularly during very low flows, is helpful at once in improving the condition of the river for boating and bathing.

Mr. Thaddeus Merriman, who made a canoe trip on the river in the summer of 1929, reached the conclusion that when the river was at a stage from 30 c. s. m. to 50 c. s. m.,

it was at its best for recreational purposes. Mr. Merriman testified:

> Q. What would you say is the best flow of the Delaware for recreational purposes?
>
> A. On my trip from Port Jervis to Belvidere, from July 22 to July 28, 1929, the average flow of the river was about 0.37 cubic feet per second per square mile. At that stage there was plenty of water in all the pools for bathing, fishing and boating, and, in my judgment, conditions were very nearly at their best for all recreational purposes. Had the flow been somewhat less, say, 0.25 cubic feet per second per square mile, the coonditions would not have been materially changed, while a greater flow, say 0.50 cubic feet per second per square mile, or more, would have made conditions for recreation less desirable (p. 4384).

Mr. Merriman also said: (p. 4387.)

> Q. In your opinion, are the summer rises of the Delaware of benefit to the recreational situation along that river?
>
> A. In my judgment, the summer rises do not particularly benefit recreation along the Delaware River. I believe that if the flow of this river could be stabilized during the recreational season, so that it would not vary outside the limits of 0.30 and 0.50 of a cubic foot per second per square mile, that all of the recreational facilities and requirements would be best served.
>
> I believe also that the sanitary quality of the (4388) water would be substantially better that it can possibly be during and after the occurrence of these summer rises. It is a difficult thing to keep people, particularly the young ones, from swimming, and as the sanitary quality of the water is always worse during and after a freshet than before, the public health cannot be improved by any summer flood.

Mr. Harrison P. Eddy, a prominent sanitary engineer, testified as follows: (4853.)

> Q. What do you say about the quality of the water at Tri-State and other points along the river for recreational use?

A. The water immediately below points of discharge of sewage is not satisfactory for bathing. For other recreational uses, such as boating, fishing and camping, the river is in good condition.

Q. Do you consider that the New York plan will affect unfavorably the sanitary conditions of the water because of reducing the effect of flood flows?

A. Flood flows during the recreational season on the whole will be more harmful than beneficial to the Delaware River. Such floods will carry large quantities of polluting material scoured from the country side, and tend to make the water objectionable. Some of this polluting matter will be deposited on the banks as the water recedes, causing objectionable conditions and some unpleasant odors.

Mr. Allen Hazen, another sanitary engineers, stated: (p. 4944.)

From another point of view the summer vacation use of the river is very important, and that comes mainly in the summer months from the 1st of July to perhaps the 15th of September, and to a smaller extent at other times.

The Delaware River above Trenton at the present time is a stream well suited for recreational uses and so clean as to give no offense to riparian owners. There is more pollution at each city that it passes, and for a short distance below it. The flow of the stream is so great and the opportunities for recreation and self-purification are so favorable that the observable effects of pollution largely disappear within a short distance below each new (4945) point of pollution.

The river retains a large part of its original purity in character throughout the entire stretch down to Trenton. The purity, of course, is not equal all the way down; it is greater in the upper reaches and less from Phillipsburg to Camden.

Carrying out the proposed plan would have the effect, as I estimate, of increasing the average flow for the thirty direct consecutive days in an average year by 8 per cent at Tri-State and 4 per cent at Trenton.

In a rather dry, but not an extremely dry, year in 30 consecutive days the increase would be greater, as stated in answer to a previous question; namely, 50

per cent at Tri-State and 10 per cent at Trenton. This increase in low water flow, in my judgment, would be a material aid in keeping the water clean and in furnishing enough water for water sports.

Mr. Hazen also said in regard to summer freshets (p. 4946):

> When the river is very low the people using the river for bathing and other sports desire more water, and any rise in the water at such a time is thought by them to be advantageous. It is my belief, however, that water delivered at a steady, well-distributed flow will be more useful for these purposes than water that comes in short floods and then disappears. Water that comes in short floods is normally much more dirty than the normal flow of the river. This is because it represents a surface wash of land, some of which is cultivated, and brings all sorts of impurity and debris of the river, frequently of kinds not found in the normal low water summer flow.
>
> There was some testimony about the debris washed out of the river by these floods. It is my impression that there may be some confusion in regard to that. Some of the debris may be the debris that is brought by these floods.

Mr. Weston Fuller, another prominent engineer, said in regard to the effect of carrying out the New York plan on the Delaware River for recreational purposes (p. 5086):

> In my judgment, the effect would be slight. In general, I should say the increased flow during the very dry periods would be beneficial. The taking of such a quantity of flood water, which comes during the time of heavy rainfall, would in no way injure the river for recreation purposes.

There was ample evidence to the contrary by witnesses for plaintiff.

I am of the opinion that the plaintiff's witnesses have over-estimated, and the witnesses of defendant and intervenor have under-estimated the effect of the operation of the New York plan on the recreational uses of the Dela-

ware river. Undoubtedly it is part of the New York plan to release compensating water every day during July, August, September and October and also on every so-called dry day during the remaining eight months of the year, that is, on every day when the water yield or runoff of the diversion area is less than .45 c. s. m. (275 c. f. s.).

The New York plan of release, however, is based upon conditions in the diversion areas, and these diversion areas are about a hundred miles from stretches of the Delaware River in New Jersey used for recreational purposes. It has happened in the past and will undoubtedly happen in the future that there will be heavy rainfalls in the diversion areas and little or no rainfall in other parts of the drainage area above the points of recreation. While under these conditions the plan of New York during July, August, September and October adds compensating water to the extent of .45 c. s. m. of the diversion area, yet not as much water is added to the natural flow as would be added under natural conditions. For instance, during the four months mentioned the natural flow into the reservoirs may be at the rate of .75 or 1 c. s. m., and in such event, under the New York plan, there is released .45 c. s. m. and stored the remainder, that is, .30 or .55 c. s. m. Under such conditions, when the river is very low, during the four months mentioned, the .45 c. s. m. released will be helpful, but during an exceedingly low stage of the river (which occurs from time to time) the release by New York will not be as helpful as the natural flow of .75 c. s. m. or 1 c. s. m. Illustrating further, if the river again reaches its record low stage at Port Jervis of 175 c. f. s., during said four months, and at that time there is little or no rainfall in the drainage area above Port Jervis except in the diversion area, and in the diversion area there is a rainfall which produces a water yield in that area of .90 c. s. m., a release under the New York plan of .45 c. s. m. (275 c. f s) would be helpful, but nothing like so helpful as the natural flow of .90 c. s. m.

(550 c. f. s.), which would occur but for the impounding by New York of the flow above .45 c. s. m.

I am of the opinion that not only the condition but also the *reputation* of the river as a place of recreation is important and should not be measurably impaired. The recreational public will be apt to ascribe to the diversion of any unsatisfactory condition of the river.

One defect, to my mind, in the New York plan of release, is that releasing of water is based on conditions in the diversion area, which may be and at times are substantially different from the conditions at Port Jervis and below.

I reach the conclusion, therefore, and so find that the execution of the New York plan will at times appreciably impair the use of the river for recreational purposes. I am further of the opinion and so find that the reduction of the diversion by New York City and the use of the Pennsylvania plan of release, which produces a greater flow of released water at critical times, and the treatment of sewage and industrial waste at Port Jervis, will eliminate any appreciable damage to the recreational uses of the river and to the reputation of the river.

I should add, in this connection, that I attach considerable weight to the evidence of numerous lay witnesses who live on the banks of the river and who testified favorably to New Jersey on this feature of the case.

XV.

AGRICULTURE.

Paragraph 43 of the bill contains the following:

> "43. At various locations and for great distances adjoining the easterly bank of Delaware River in the state of New Jersey there are extensive areas of rich alluvial bottom lands within and underneath which there is a permanent supply of ground-water available for and which in fact does supply moisture to the roots of agricultural crops and productive plants, insuring large, uniform and unfailing crop production from

these lands. The productivity of these lands depends in a large measure upon the maintenance of the ground-water level available to supply moisture to crops thereon at such a depth below the surface as to be within available reach of the plant roots. The ground-water supply under these lands is at such a depth over large areas as to be best adapted to supplying the water requirements of agricultural crops. The ground-water level underneath these lands is maintained and the water in part supplied by the waters of Delaware River. The diversion proposed by the City of New York will lower the level of water in the river and will also lower the level of ground-water under the adjacent lands to the detriment of these lands for crop production, both as to lands situated immediately upon the banks of Delaware River and also as to lands at some distance therefrom but situated at such elevation relative to the river as to benefit by the ground-water supply in and adjoining the river valley. The lowering of the ground-water level underneath these lands will render the moisture supply derived therefrom less readily available to growing crops. The presence of this ground-water table tends to prevent failure of crops during prolonged droughts and to increase the volume of yield of crops grown on these lands. As a result of reduction in water levels both in the adjacent river and underneath, these lands by the city's diversion, and the consequent reduction in the moisture derived from this ground-water supply, the productivity and value of lands in the state of New Jersey, aggregating not less than 5,000 acres in extent, will be wholly or in part diminished or destroyed."

In the taking of the proof it developed that there were 3,650 acres of land divided among 26 tracts between Port Jervis and Trenton which the plaintiff claims will be adversely affected as to agricultural productivity by the carrying out of the New York plan. (See Exhibits 235 and 237.) These 26 tracts of land (total acreage 3,650 acres) lie at points along the Delaware River within the State of New Jersey. Some of the tracts are on islands in the Delaware River, these islands belonging to the State of New Jersey.

The main witness on behalf of the plaintiff was Mr. Jacob A. Harman, a prominent civil engineer who specializes in farm drainage and who has had wide experience in supervising and constructing drainage ditches and levees in the Mississippi valley and elsewhere. Mr. Harman had also had practical farming experience. He stated that he had examined the 26 tracts of land just referred to. These tracts of land lie from ten to thirty feet above the ordinary water levels in the Delaware River. The soil is characterized by the United States Bureau of Soils under the "Chenango Soil Series." The lands are of a sandy type underlaid with coarser sand and gravel. Test wells were dug by Mr. Harman on a number of these tracts, the result showing that the ground-water level under these tracts of land rose and fell generally with the rise and fall of the Delaware River. The moisture for the crops on these lands, he stated, was supplied by rainfall and by the capillary attraction of water from the ground-water level to the roots of plants. The capillary attraction is much greater in the finer top soil than in the lower gravelly soil. He stated that the lowering of the river from one to three inches could change conditions so that the capillary flow of water would at times be broken and that this would be injurious to crops.

In discussing the evidence of Mr. Harman, plaintiff in its brief before me said:

> "Extensive experiments show that the water will rise by capillarity from two or three inches to a foot or two, according to fineness of soil. In clay soil the capillary flow has been measured to as much as ten feet above the source of water supply, and a very substantial amount of flow at six and eight feet above the supply. Some experiments indicate capillary rises of as much as 25 or 30 feet, but the practical limit seems to be under 10 feet. In some of these soils the water will rise 4 or 5 feet by capillarity, and in much of the area it would average from 2 feet to 3 feet. He had the report of the United States Department of Agriculture Soil Surveys of the Delaware River valley

when he made his investigations in November, 1929. He made deeper borings and investigations, as described in this testimony, as the soil survey only examined the surface soil (S. M., 3346-8).

"He considers that the high waters of the winter and spring have a direct value to the agriculture on the first terrace lands and that the summer rises give some advantage to the lands that lie close to the river. If there is not sufficient moisture for germination and growth in the months of May and June for a proper plant growth the season will be too short for proper growth of a normal or abundant crop, even with plenty of moisture thereafter. The roots require several weeks, or a month or more, to reach their full growth. Most crops reach their maturity in July or August. A let-down of water during August and September would be of little value to most of the crops produced in that valley. Frosts occur in late September or early in October and there is then no crop growth until the next planting season in the spring (S. M., 3349-50).

"Moisture travels upward in the soil as vapor and is condensed. It also travels downward in certain periods of the year under certain conditions. Moisture travels upward especially when the soil surface is cool. That can happen after a rain. In the winter time in particular that is true. The soil may be very dry, and as the winter season progresses the moisture will come up from the lower soil in the form of vapor and be condensed and frozen; that vapor transfer takes place to some extent whenever the temperature of the surface is lower than the temperature of the soil below. Evaporation operates on an entirely different principle from capillary attraction, and the transfer of moisture as vapor is greater in open soil because the space is greater (S. M. 3352)." (Pages 478-9 Plaintiff's brief.)

Mr. Harman was supported in his evidence by Dr. Jacob G. Lipman, Professor of Agriculture of Rutgers College, and Dr. Linwood L. Lee, specialist in soil utilization at the New Jersey Agricultural Experiment Station and Professor of Soils at the New Jersey Agricultural College.

On the other hand there testified for the City of New

York Professor Ora S. Morgan, Professor of Agriculture of Columbia University, Mr. John H. McManus, a civil engineer who had made a study of ground waters between Port Jervis and Lambertville, New Jersey, and Professor Chas. P. Berkey, a distinguished geologist; and on behalf of the Commonwealth of Pennsylvania there testified Mr. Arthur E. Morgan, an engineer of wide practical experience in the development of agricultural lands.

The evidence of the plaintiff's witnesses was to the effect that the carrying out of the New York plan would, to some extent, adversely affect the agricultural productivity of the 3,650 acres of land involved.

The evidence of the witnesses for New York and Pennsylvania was to the effect that the land obtained practically all of its moisture from rainfall and only a trivial amount of moisture from ground-water or the seepage of water from the river, and that any lowerings of ground-water levels underneath the lands involved were so slight as to have no substantial effect. It appears that about half of the lands involved are in woods, leaving about 1,800 acres of lands now devoted to agriculture. The most reasonable deduction which I am able to draw from the conflicting evidence of these experts is that the carrying out of the New York plan would have little effect upon agriculture. The record shows that there are several abandoned farms along the Delaware River and on the inspection trip I noted that this was true. My observation on the inspection trip was that agriculture was a diminishing rather than an increasing activity. It further appeared that the best sales of land along the Delaware River were made to parties desiring to use the lands for recreational purposes rather than agricultural purposes. I may add that on the inspection trip it appeared to me that the crops on the bench or terrace above the lands in question (admittedly at an elevation where they are not affected by the Delaware River), appeared quite as good as on the lands immediately adjacent to the river. The value of the lands

claimed to be affected is estimated from twenty-five to over two hundred dollars an acre.

On the whole I am quite content in the conclusion and finding that the carrying out of the New York plan will have a very slight adverse effect on agriculture, and I think that such slight adverse effect will be very largely, if not entirely, overcome by the modification of the New York plan as set out in this report.

XVI.

FISH.

Paragraphs 27, 28, 29 and 30 of the bill read as follows:

"27. Since the year 1678 the inhabitants of New Jersey have continuously enjoyed the liberty of fishing in the Delaware River under statutory enactments. During all of that time, shad fishing had been an important and profitable industry. Since 1870 shad fishing in particular had been fostered and regulated by legislation and boards or commissions established and maintained by the plaintiff, and by concurrent legislation of the plaintiff and the adjoining States of Delaware and Pennsylvania. During the past half century the number of shad taken within the territorial limits of the plaintiff has ranged from seventy thousand to more than four million per year, having a value ranging from $175,000 to more than a million dollars per year. As the pollution of the river increased with the growth of the cities along the Delaware River and its tributary, Lehigh River, the number of shad taken gradually decreased. During the past decade these cities have expended large sums of money to reduce the pollution of the river by the construction of sewage disposal plants, and as the pollution decreased the shad have returned to the river in increased numbers.

"28. The plaintiff has expended large sums of money to provide and maintain hatcheries for the propagation of shad and other kinds of fish within its territorial limits in the Delaware River. During the sea-

son 1927-1928 plaintiff planted in said river 20,745,000 small fry of shad and white and yellow perch.

"29. The pollution from the effluent of sewage disposal plants, industrial and mining waste and surface drainage has been dissipated by the natural oxygen and by the flushing effects of flood and semi-flood waters produced by storms in the watershed, which are particularly necessary during the summer months.

"30. The diversion of the waters proposed by said City will substantially deprive the river, within the territorial limits of the plaintiff, of the necessary supply of oxygen and said flushing effects and seriously affect, if not destroy, the fishing industry of the plaintiff and its citizens."

These allegations of the bill as to the effect of the New York diversion are denied by the defendant.

On behalf of the State of New Jersey there testified Mr. Walter H. Fell, Secretary of New Jersey Fish and Game Commission, and also Mr. Herbert F. Prytherch, Biologist, United States Bureau of Fisheries, and a number of persons engaged in shad fishing.

It appears from the evidence that the shad migrate from the sea into the Delaware Bay and River during the spring of each year, the season extending from March until June the heaviest catches of shad being made the latter part of April and the early part of May. The shad fishermen were of the opinion that when the flows of the river were high more shad came into the stream, and that it was necessary also to have reasonably high flows so that the shad could return to the sea after the spawning season. The shad come from the sea into the rivers in the spring for spawning and, after spawning, return to the sea. The young shad after being hatched also make their way to the sea and after several years attain their maturity in the sea and then, through a natural instinct, return to the same waters where they were spawned. The shad industry is subject to various vicissitudes. There has been a great decrease in the number of shad caught in the Delaware River as well as in other streams flowing into the Atlantic

ocean. The industry appears to be a declining one. In 1900 there were over four million shad caught in the Delaware River, whereas, in 1929, there were only about ninety-four thousand caught. Exhibit No. 349, which is set out herein, shows the number of shad caught in the Delaware River from 1900 to 1929, with the exception that for some years no records were kept and for these years no information is available. I set out herewith the contents of Exhibit 349:

Exhibit N. Y. C. 349

DELAWARE RIVER CASE

Number of Shad Caught in Delaware River
1900 to 1929

Year	N. J. Records of No. Shad caught (From testimony, pp. 3602-3608)	Mean Flow of Delaware River cubic feet per second (From Exhibit 327)			Maximum Day's Flow Cubic feet per sec. (From Exhibit 327)	
		March	April	May	April	May
1900	4,062,307					
1903	1,000,000					
1904	1,240,350					
1905	870,975					
1907	"Very few"	21,300*	11,300*	8,930*	19,700*	11,500*
1910	757,394	33,900*	19,400*	12,200*	66,700*	27,900*
1913	754,770	28,900*	21,200*	10,500*	42,100*	30,400*
1916	227,487	12,700	35,800	10,800	89,300	19,600
1917	161,000	21,400	18,000	8,290	43,300	13,200
1920	43,724	35,500	27,100	10,700	51,900	17,200
1921	20,102	32,700	16,600	12,800	27,400	29,400
1923	34,160	28,000	19,200	14,600	75,400	27,400
1925	101,865	17,300	12,500	10,000	18,900	12,000
1926	94,747	18,500	20,000	6,940	46,900	14,400
1927	41,603	27,000	11,400	15,800	17,300	44,500
1928	60,169	13,500	24,700	19,400	44,500	45,700
1929	94,853	27,500	29,800	18,400	59,700	31,400

* At Riegelsville Area 6190 sq. mi. Other flows at Trenton, Area 6800 sq. mi.

While the shad fishermen state that high flows in the river during the spring are likely to produce a greater migration of shad into a stream and are also helpful in facilitating the return of shad to the sea after spawning, yet an examination of the statistics just set out in Exhibit 349 fails to establish any direct relation between stream flow and the catch of shad. Very little is known as to what happens to the shad after the return to the sea. What

enemies they encounter there and what obstructions to the return of shad to fresh water are not fully known. Mr. Fell, the Secretary of the New Jersey Board of Fish and Game Commission, testified as follows:

"Q. Have you any idea why there were four million fish caught in 1900 and only 41,623 in 1927?

A. I couldn't give any scientific reason. The catch of fish is dependent upon the condition of water, oftentimes, temperature of the water. It is dependent upon pollution of several years previous. If the pollution has killed the young fish going down the stream, that would have an effect on several years to come. They would not have grown up to ascend the river and spawn further. But I have no specific knowledge as to that.

Q. Well, have there been any studies made by reason of this great falling-off in the number of shad in the Delaware River, as manifested by these statistics, by your Board?

A. Our Board has made no particular study. We have gathered statistics. We used to catch shad eggs, but shad got so scarce, the breeder shad, the roe shad, that we couldn't get the eggs. We hatched them in connection with Pennsylvania."

Mr. F. B. Marsh testified on behalf of the defendant city as follows:

"Have you compared the number of shad caught each year, as testified to by Plaintiff's witness, Walter H. Fell, and the testimony as to the flow of water in the Delaware River in the spring months, to show whether there is any relation between the amount of the flow and the number of shad caught?

A. Yes, I have. As has been testified, the usual time for catching shad is from about the middle of April to the middle of May, with occasional variations of a week or two at either end. I find there is no definite relation between the number of shad caught in a given year and the discharge of the river during or immediately preceding the time that the shad are caught. For example, the average flow in 1920 for both March and April in the Delaware River was very

high, and yet the number of shad caught was only 43,724, as against 101,863 for the year 1925, when the flow was less than half as much for both months.

"Similarly, for the year of the lowest recorded catch, which was 1921, when only 20,102 shad were caught, the flow was only slightly below that for 1910 and 1913, in each of which years over 750,000 shad were caught. The testimony shows that 4,062,307 shad were caught in the year 1900, but the stream flow records of the lower river do not go back of 1907, so that there is no direct comparison of the number of shad caught and the flow in 1900. However, the 4,062,307 shad caught in 1900 is very nearly forty times the maximum number caught in any of the years since 1920, the maximum for those years being 101,863 in the year 1925.

"It is impossible that the flow of the Delaware River in 1900 could have been forty times what it was in 1925. Obviously, the reduction in the number of shad caught from the recorded figure in 1900 to the present maximum figure of around 100,000 has not been due to changes in river flow.

"Q. Have you tabulated the data available from the testimony you have referred to on the number of shad caught and the flow of the Delaware River for those years when the shad were caught,

A. Yes, sir.

Q. I show you a blue print and ask you what that is?

A. I prepared this table, showing in the first two columns the number of shad caught each year for which records are in evidence. In the following three columns I have shown the mean flow of the Delaware River in cubic feet per second for each of the months of March, April and May. These figures are from Exhibit 327. In the last two columns, for purposes of comparison, I have noted the maximum daily flow in cubic feet per second for each of the months of April and May, also from Exhibit 327. This tabulation shows there is no relation of any kind between the flow of the river and the number of shad caught (p. 5055).

In Bureau of Fisheries document No. 1050 (Department of Commerce of the United States Bureau of Fisheries) it is said:

"The Bureau of Fisheries has made 12 statistical canvasses of the fisheries of New York, New Jersey, Pennsylvania and Delaware, during the 47 years from 1880 to 1926. While the frequency of these canvasses is not all that might be desired, nevertheless, it is believed they offer a fair statistical picture of the trend of our fisheries in this section." (Ex. 350, pp. 487-8.)

And in the same document there appears the following in regard to shad:

"Shad.—The production of this fish, which is considered by some to be the choice fish of the Atlantic seaboard, suffered the severest decline of any in this region. The peak catch was taken in 1901, when 21,814,000 pounds were caught. In 1904 the production dropped to 6,623,000 pounds, or slightly more than in 1880. A further decline was recorded for 1908, and in 1921 only 390,000 pounds were reported, or about 2 per cent of the amount taken in 1901. In 1926 there was a recovery and 952,000 pounds were produced." (Ex. 350, p. 489.)

Mr. Prytherch of the U. S. Bureau of Fisheries testified that he was acquainted "with what limited data we have on shad in this country and I will admit that the investigations are not complete." He, however, was of the opinion that high waters stimulated the migration of shad and that there is a direct relation between the high flow in the river and the migration of shad. I am unable to find that such a relation is definitely established.

Mr. W. H. Fell, the Secretary of the New Jersey Fish and Game Commission, testified that for recent years his records cover fiscal years from July first to June 30 and that, while his records are not complete, the following compilation from his records was made by plaintiff and shows the number of boats, nets and men and the value of boats and nets employed in shad fishing in New Jersey and the number and value of the shad catch as reported to his department, as follows:

"1924-25—Boats and nets 152, men 312, value boats and nets $45,425; number of shad 101,863, value $101,076.

"1925-26—Boats and nets 156, men 325, value boats and nets $63,025; number of shad 94,747, value $127,619.

"1926-27—Boats and nets 114, men 227, value boats and nets $54,765; number of shad 41,603, value $50,125.

"1927-28—Boats and nets 116, men 239, value boats and nets $63,050; number of shad 60,169, value $68,000.

"1928-29—Boats and nets 127, men 273, value boats and nets $53,665; number of shad 94,853, value $93,721 (p.3603).

"Prior to that time the records were not so complete in detail, but they do give such information as is available on the number and value of the catches over a period of years: 1922-23, 34,160; value $41,450. 1920-21, 20,102; value $28,000. 1920, 43,724. 1917 (Maurice River only), 2,800, last week in April. 1916-17, 161,000. 1915-16, 227,467. 1912-13, 754,770. 1909-10, 757,394. 1906-07, (Del. R. & Bay, very few shad caught). 1904-05, 870,975. 1904 (spring), Trenton to Bayside, 1,240,350. 1902-03, 1,000,000. 1899 (Del. R. furnishes 262 miles of fishing ground). 1900, 4,062,307" (p. 3607-8).

It appears also from the evidence that the State of New Jersey maintains a fish hatchery at Hancock Bridge in Salem County for the purpose of aiding and stimulating the shad industry and that this fish hatchery has hatched and put into the Delaware River shad fry in large numbers, as follows: 1926-7, 40,000; 1927-8, 120,000; 1928-9, 2,688,000; 1929-30, 3,094,000. While, necessarily, there must be sufficient water in the river so that the shad can migrate upstream during the spawning season and also sufficient water in the river so that the shad, after the spawning season, can return to the sea, yet it does not appear that there is any absolute relation between the high flows and the heavy catches of shad.

On the record in this case, I am of the opinion that the pollution of the Delaware River has had a much more damaging effect on the shad industry than have the variations of the flow in the river from year to year. There are, no doubt, other causes for the decline in the number of shad migrating into the Delaware River as into other streams flowing into the Atlantic Ocean, but these other causes are of an obscure character which will have to be determined by a more extensive and intensive study by fish experts. The greater part of the pollution of the Delaware River, so far as shad is concerned, comes from Pennsylvania and New Jersey, and the correction of this pollution is beyond the scope of the instant case. However, there is, as already stated, substantial contribution of pollution from the State of New York and particularly from Port Jervis. The treatment of sewage and industrial waste at Port Jervis will leave the Delaware River in a relatively clean and sanitary condition where it enters the State of New Jersey, and it will then be a matter for New Jersey and Pennsylvania to correct and prevent undue pollution below Port Jervis. To me, as a layman, I can well understand how the migration of shad up the river in the spring would be materially reduced by reason of the polluted condition of the river below and at Philadelphia and Camden. At the time of the inspection trip the pollution of the river between Philadelphia and Camden was such that a distinctly disagreeable odor was noticed.

In short, I am of the opinion and so find that pollution has been a much greater factor in decreasing the run of shad than the natural variations in stream flow. While the carrying out of the New York plan will decrease the total volume of water flowing in the stream during the year, yet under the New York plan the flow of the stream will be increased during very dry periods. I reach the conclusion, therefore, that the carrying out of the New York plan will probably have little damaging effect on the shad industry. I find that effect will be slight, and that any

such damaging effect would be largely, if not altogether, removed by the treatment of sewage and industrial waste at Port Jervis by limiting the water taken by New York and by increasing the water released from the impounding reservoirs, as hereinafter recommended.

XVII.

OYSTERS.

In the bill of complaint there are the following allegations relative to the oyster industry of Delaware Bay:

"25. Within the territorial limits of the plaintiff, under the waters of the Delaware River and Delaware Bay are located oyster beds having an area of 50,000 acres in which has been developed and maintained an industry producing four million bushels of oysters annually, having a value of approximately $7,000,000. Of this area 20,000 acres are reserved by plaintiff for the benefit of its citizens for the propagation of seed oysters, and 30,000 acres are leased by plaintiff to and cultivated by its citizens for the growing of oysters for market. This business has been carried on since the original settlement of the country and, since the year 1799, has been fostered and promoted by statutory enactments and commissions or boards created by the Legislature of the plaintiff and by the concurrent legislation of plaintiff and its sister states across the river and bay. During the past 35 years this industry has more than doubled in volume and value of product. The plaintiff has appropriated and expended therein approximately $1,000,000 and the citizens of the plaintiff have invested in said industry upwards of $15,000.000.

"26. The natural home of the American oyster is close to the mouth of the streams entering the sea, where fresh and salt water mix in approximately equal proportions. The food of the oysters comes primarily from the fresh water. Its enemies, consisting of drills, drum fish, star fish and black mussels, all come from the sea and menace the oyster beds only when the supply of fresh water is reduced and the degree of salin-

ity increases. The oyster industry in the Delaware Bay could not exist except for the supply of fresh water which comes down the Delaware River, the flood waters of which are essential to drive out of the bay the high salinity and the oyster enemies which invade the oyster beds only during low fresh water periods. The plaintiff's oyster beds in Delaware Bay constitute a source of great potential wealth to the State and is the only natural resources in the State which has increased under exploitation by man. Plaintiff is the only State in the Union which has shown a growth in the oyster business in the past 25 years. Except for the natural flow, including floods, in the Delaware River the oyster drills would destroy a million dollars worth of oysters a year in Maurice River Cove (Delaware Bay) alone, and under reduced flow of fresh water these drills have been known to move as much as 15 miles upstream in Delaware Bay. The proposed diversion of waters from the Delaware River would extend the present period of one month of dry weather flow in the Delaware River to a period of approximately five months duration, at the time of year when fresh water is most needed, when the oysters are most susceptible to adverse influences, and when their destructive enemies are most active and effective. The oyster industry is almost the sole means of support for the larger portion of the population of two entire counties in New Jersey. The oysters produced annually in Delaware Bay, within the territorial limits of the plaintiff, have a food value equivalent to that of 150,000 dressed steers. The oyster beds of the plaintiff are most favorably located, for the most profitable development, with respect to the mixture of salt and fresh waters. It is impracticable to move these oyster beds to meet the changing conditions that will result from any diminution of the flow of fresh water into Delaware Bay. The diversion of water proposed by said city from the headwaters of the Delaware River will substantially change the degree of salinity of the water in the Delaware Bay, and ultimately destroy the oyster industry of the plaintiff and its citizens in the Delaware River and Bay."

These allegations of the bill as to the effect of the New York diversion were denied by the defendants.

There was much evidence of a scientific and technical character relative to the oyster industry.

Undoubtedly the oyster industry of the State of New Jersey in Delaware Bay is an important and extensive one. It has had the fostering care of the State for many years, and the State has done much towards extending and developing this industry. The natural oyster beds cover about 20,000 acres and the planted oyster beds about 30,000 acres. The natural oyster beds and the planted beds are separated by an imaginary line known as the Southwest Line. The locations of these beds are shown on Exhibit 214. The natural oyster beds were originally a few spots of natural oysters but these spots have been extended so that the natural beds are now almost continuous from a point above the Southwest Line to Arnold's Point. The extension of the natural beds has been effected by scientific dredging and particularly under the operation of what is known as the "rough cull" law. Under this law there is a sorting of oysters as they are dredged from the natural beds and the shells to which no spawn or spat have become set are thrown back and in addition large quantities of shells from the shucking houses are also deposited on and around the natural beds for the oyster spat to become set thereon. The dredging of these beds is backwards and forwards and the end of each turn of the boat the shells upon which there is no spat are thrown back into the water and in this way the beds have been gradually extended. The planting grounds are south of the natural beds, and these grounds have been gradually developed by the planting of young oysters on them. The State is the owner of the natural beds and also the owner of the submerged lands used for planting grounds. These planting grounds are leased to various persons and corporations, the boundary of the several leaseholds being shown by poles or stakes driven into the bed of the Bay. Exhibit 216 shows the extent of this industry.

The annual value of the oyster crop ranges from four million to six million dollars or more annually. In 1929

there were 247 boats of a tonnage of 7,590 tons licensed to engage in the industry. There were 232 lessees from the State of planting grounds. There were also 250 licensed tongers. The tongers remove the oysters from the bed of the Bay by manually operated tongs. The more extensive operation of removing oysters for the market is done, however, by dredges. There are about 2,500 to 3,000 persons engaged in the oyster business in Maurice River Cove, which is the center of the industry. That particular portion of the State is nearly altogether dependent upon the oyster industry for a livelihood. In 1929 the banks in that section of the State advanced over a million dollars to those engaged in the industry. The lands adjacent to the natural and planted oyster beds are not well suited to agriculture and the livelihood and prosperity of those living in that part of the State are, as stated, dependent largely upon the development of the oyster industry.

There is a large investment in boats, shucking houses and shipping facilities. The two railroads serving this portion of the State have made extensive investments in trackage and shipping facilities for the benefit of the industry. The State itself has spent over a million dollars in the development of the industry, and has received in return, presumably for licenses and rent, something over $800,000.00, though it is expected that in the future the investments of the State will yield a large profit.

I have no hesitation in finding that the oyster industry in Delaware Bay is a large and imporant one and that it has been carefully fostered, protected and policed by the State of New Jersey. Indeed, it would seem that the State of New Jersey has probably done more than any other state in preventing the destruction of a great natural resource and food supply. The natural beds are valued by the State Board of Shell Fisheries at more than $26,000,000.00, and it is estimated that the oyster planters in Delaware Bay have investments of over $18,000,000.00. These

figures are not exact but there can be no doubt that the life of the communities in the vicinity of Maurice River Cove where the towns of Bivalve and Port Norris are located is dependent upon the oyster industry and the incidents of that industry. There was a large volume of proof on this feature of the case. The principal witnesses for the State of New Jersey were Professor Thurlow C. Nelson, Professor of Zoology at Rutgers College of New Jersey and Biologist of the State Board of Shell Fisheries, Mr. J. Richards Nelson, Associate Biologist of the State Board of Shell Fisheries, Mr. Herbert F. Prytherch, Biologist of the United States Bureau of Fisheries, Professor Harold A. Thomas, Professor of Hydraulics at Carnegie Institute of Technology at Pittsburgh, and there also testified several practical oyster men who were engaged in dredging, planting, shipping and marketing oysters. Every feature of the industry was gone into in great detail. Mr. Prytherch and Professor Nelson described in detail the life, development and cultivation of the oyster. From the natural beds above Southwest Line there have been removed during the course of years young seed oysters and these have been planted in the planting grounds below Southwest Line so that there are now about 30,000 acres of planted grounds.

The oyster comes out of hiberation in April and the spawning season occurs in July and August.

The main ground relied upon by the plaintiff on this feature of the case is that the carrying out of the New York plan will necessarily mean the abstraction of a large quantity of fresh water and this will have the effect of increasing the salinity of the waters of the bay in which the oyster grounds are located. The evidence shows that the salinity of the sea just off the Delaware capes is approximately 33—that is, 33 parts of salt in a thousand parts of sea water. An oyster cannot live in a salinity so high as that, and the proof of the plaintiff is to the effect that the fresh water of Delaware River commingling with the salt water of the sea at and in the vicinity of the Southwest Line pro-

duces a water of just the correct degree of brackishness for the best and most successful growth of the oyster.

The proof of New Jersey also is to the effect that the carrying out of the New York plan will necessarily result in increasing the salinity of the water of the oyster grounds and that this will be adverse to the growth and development of the oyster, and particularly an increase of salinity of the natural beds will permit the enemies of the oyster to destroy or do great damage to these beds or a part of them. The principal enemy of the oyster is what is called the drill. Other enemies are star fish, mussels and drum fish. The proof of plaintiff is that the oyster lives and thrives in a salinity lower than that in which these enemies can survive, and that an increase in salinity over the oyster beds will permit the inroad of these enemies and that these enemies will do great destruction to the young seed oysters. The proof is that the drills die at a salinity of 12.5, star-fish at a salinity of 12.18 and mussels at a salinity of 17. The oyster itself lives in quite a range of salinity and, indeed, the proof shows that at the Southwest Line (referred to in the record as Station 17), there is quite a wide range of salinities from time to time. Plaintiff's Exhibit 230, for instance, shows that on August 4, 1927 the salinity at this station was 23.1; on September 8, 1927, 18.2 and on July 19, 1928, 15.1. Readings taken in July and August, 1929 show a salinity of 24.4. It will thus appear that the salinities in which the oysters live and thrive has a variation of not less than nine or ten parts. Indeed on the same day the salinities vary four or five parts. Exhibit 230 shows a variation of over four units in one day. The salinity, of course, necessarily changes with the ebb and flow of the tide and with the flow of the river. During very high flows in the river the salinity decreases, during low flows the salinity increases. Exhibit 230 shows numerous salinity tests made at varying depths and varying stages of tide. As the water moves down stream and approaches the sea the salinity, of course, increases. The salinities

over the natural beds are lower than the salinities over the planted grounds. In other words, the oysters live and thrive on the planted grounds in considerably higher salinities than on the natural beds. The seed oysters, however, are not removed from the natural beds until they have developed a sufficient hardness and thickness of shell so as to withstand better the attacks of their enemies.

Professor Thomas, on behalf of the State of New Jersey, testified that if the New York diversion had been in operation for several years prior to July, 1928, the salinity at the Southwest Line would have been increased from 13 to 13.6, and that in the fall of 1929 such salinity would have been increased by the operation of the New York plan from 22.2 to 23.7. He further testified that the effect of this increase in salinity would be, *on the average*, to shift conditions now existing at Southwest Line approximately 1½ miles upstream. In other words, the general effect of the New York plan would be to remove existing salinity conditions at the Southwest Line and the replace those conditions on an average a mile and a half upstream. He also estimated that the effect of such diversion would be to destroy approximately 16½% of the value of the oyster industry in Delaware Bay. The general effect of the evidence of the practical oyster men was that the oyster crop is better in wet years than in dry years.

Professor Thurlow C. Nelson has devoted a large part of his life to the study of the oyster, and he traced in great detail the life of the oyster from the time of spawning to the time of the delivery of the oyster to the consumer.

I will at this point state my entire confidence in the good faith, integrity and abilities of this witness. He is evidently rendering a great service to the State of New Jersey. He is a public servant who is not conspicuous in the public eye by reason of accomplishing anything sensational, but by constant application to his chosen profession he is adding much to human knowledge and rendering a distinct contribution to science. While I have no doubt, therefore,

that Dr. Nelson stated with entire candor and truthfulness his conclusions as to the effect of the New York plan, yet I have been unable to follow him in all of his conclusions in view of outstanding facts with which I think they cannot be reconciled. To me it appeared that the oyster planting grounds were the workshop or laboratory of Dr. Nelson, and I can well understand how one so devoted to his profession, as he is, would object to any slight change of conditions in his laboratory, and I feel that in his zeal and interest in his profession he has unconsciously over-estimated the effect of the carrying out of the New York plan. I make reference to this matter here for the reason that Dr. Nelson made a most favorable impression upon me and his interest in his profession is so sincere and constant that I feel a real regret in not being able to agree with all his conclusions.

The evidence on the part of the plaintiff indicated that the present favorable salinities over the natural beds are not only due to the intermingling of the fresh waters of Delaware River with the salt waters of Delaware Bay, but that the flow of the Delaware River into the sea produces a pool of relatively fresh water at the mouth of the bay and that this pool of fresh water to some extent was brought back into the bay by the tides, and this also served to keep a suitable admixture of fresh and salt water so as to produce the most favorable salinities for oysters.

Dr. Nelson brought in as part of his evidence the result of investigations and observations made by Dr. Bigelow of Harvard University relative to this pool of fresh water at the mouth of Delaware Bay and the drift of same. The observations of Dr. Bigelow are set out in a bulletin of the Museum of Comparative Zoology of Harvard College. I am unable to conclude, however, that Dr. Bigelow definitely and absolutely found that there is a permanent pool of fresh water at the mouth of Delaware Bay. The indications are that there is a drift of this water from the mouth of the bay and that Dr. Bigelow's observations were only

tentative as he states that he regarded the problem as intricate and the reliable data too scanty for a final conclusion.

Mr. Prytherch also testified on behalf of the plaintiff as to the heat produced by the warmer Delaware River waters commingling with the colder waters of the bay, and the resulting favorable condition for the development of the oyster. It was the opinion of Mr. Pyrtherch, Professor Nelson and his brother, J. Richards Nelson (who had had considerable practical experience), and Professor Thomas that the carrying out of the New York plan would have a damaging effect on the oyster industry by increasing the salinity in the oyster grounds and thereby rendering the oysters more liable to an attack of their enemies, by reducing the temperature of the waters in the oyster grounds, and by reducing the natural nutrients of the oyster coming from fresh water and also by reducing the chemical substances in fresh water, which are necessary for the attachment of the oyster to the shell and necessary for the growth of the oyster. Much of the evidence on these points was highly technical in character. There was also evidence by the plaintiff showing the great food value of oysters, as containing vitamins and other ingredients necessary to the physical welfare of the human being.

Professor Nelson gives the following summing up of the effect of the proposed diversion (pp. 2929-30):

> "In summing up, therefore, a diversion of water from the Delaware River above the Maurice River Cove area, as proposed by the New York plan, would take away from the oyster industry fresh water which is necessary: first, to supply the necessary low salinity and salts required for the attachment of the oyster larvae; second, it will decrease the fresh water run-off, and by so much decrease the tendency of the oyster larvae to work up-stream away from the sea. It will decrease the food of the oyster. It will increase the sphere of activity of all of the enemies of the oyster which have been enumerated. It will increase the intensity of attack by these enemies, and will result in a permanent shift of the oyster-bearing areas upstream,

so that Bennie's Bed, which now represents the optimum for natural oyster production, will no longer be the optimum area, but there will be a shift to the north.

"It will be appreciated, from an examination of Exibit 124, that any permanent shift in the salinity condition in that area will cause an extensive loss of territory to the oyster growers. The distance from the outer line marking off the oyster-bearing areas to the mouth of Dennis Creek is 13 nautical miles. The distance from East Point across that same line is 9½ miles. The distance from Arnold's Point across to the line is 4½ miles. Therefore, any upstream shift will cause a correspondingly great decrease in the available areas for oyster production, because Delaware Bay becomes successively narrower as we pass upstream towards the upper end of the oyster areas.

"Furthermore, it has been shown that the production of the natural oyster has required many, many years. The conditions that obtain in these areas are the result of what has taken place during thousands of years preceding. So that if the salinity be so increased as to admit oyster drills to Bennie's Bed, the backbone of the natural areas will be destroyed."

On behalf of the City of New York there testified Mr. Harry A. Marmer, Chief of the Division of Tides of the United States Coast and Geodetic Survey, Mr. L. P. Wood, a civil engineer, Mr. William F. Wells, a biological engineer, and Dr. Payne D. Parsons, bacteriologist for New York State; and on behalf of the Commonwealth of Pennsylvania, Mr. Arthur E. Morgan, a civil engineer who had given a great deal of study to biology and who brought into the record the opinion of Dr. Henry Federighi, an expert on oyster culture. Mr. Marmer testified that instead of a pool of fresh water at the mouth of Delaware Bay there was a southerly coastal current with a velocity of about two miles per day, and the effect of this current is to carry fresh water from the mouth of the bay, its place being taken by ocean water.

In regard to any change in salinity Mr. Wood testified as follows (pp. 5019, 20-21):

"Q. Have you computed how much the salinity number would be changed by a reduction of the stream flow in the Delaware Bay?

A. Yes, sir, I have compared the average salinity in the months of July and August in the area from Station 17 on the Southwest Line, to Station 26 on Bennie's Bed, with the stream flow at Trenton, for the months of May, June and July.

Q. What did you find?

A. In 1927, when the stream flow was 51 per cent smaller than in 1928, the salinity was 4.1 units higher. If the stream flow had been 5 per cent less instead of 51 per cent less, the corresponding increase in salinity would have been four-tenths of a point.

Another example. In 1929, when the stream flow (5020) was 54 per cent less than in 1928, the salinity was 7.6 units higher. If the stream flow had been 5 per cent less instead of 54 per cent less, the corresponding increase in salinity would have been seven-tenths of a point.

Q. If the stream flow during July and August should be augmented in accordance with the New York Plan, how would the saltness in Delaware Bay be modified?

A. When the stream flow is increased by operation of the Plan, the salinities will be reduced.

Q. Would a reduction of 5 per cent or less in the flow of the Delaware River during the three months before August 1st have any measurable effect upon the mid-summer salinity in Delaware Bay?

A. No, the salinity number would be changed by something like half a point at the most.

Q. You have testified that in the 23 years during which the stream flow at the Trenton gaging station has been measured or can be closely computed, the three months, May, June and July, were drier in 13 out of the 23 years than either 1927 or 1929. What was the probable salinity in Delaware Bay during July and August of these 13 years.

(5021) A. It was probably higher in each of those years than in either 1927 or 1929."

Mr. Wells, a biological engineer and oyster expert, testified as follows:

"Q. You are familiar with the Plan of the City of New York for taking water from the Delaware River

and for the releases of the reserved flow therein provided?

A. I am.

Q. You have read the testimony of Messrs. Prytherch and Nelson and others on the oyster situation in Delaware Bay, and the exhibits which accompanied their testimony?

A. Yes. I have studied them all.

Q. In your judgment how would the Plan of the City operate to affect the oyster planting grounds in Delaware Bay?

A. The effect would be very slight, and if measurable would not be injurious.

Q. In your judgment, how would the Plan of the City operate to affect the oyster seed-bearing area in the Delaware Bay?

A. The effect would be exceedingly slight and would produce no measurable effect.

Q. In your judgment would the Plan of the City (5046) operate to intensify the activities of the known oyster enemies?

A. The effect on the activities of the enemies could not be measured."

Mr. Morgan, testified that the effect of the diversion would show a range in salinity from a quarter of a part per thousand to not exceeding one and one-half parts per thousand and that the greatest reduction in salinity would be when the flow in the river was greatest. Mr. Morgan also said (p. 6130):

"A. On Exhibit 214 of the State of New Jersey is a map indicating the oyster seed beds and the oyster planting grounds, and also the salinity limits of those seed beds. Now, within the oyster planting grounds the entire area has a salinity, according to the testimony of New Jersey, on Exhibit 230, that at every point where it was recorded is greater than that necessary for the oyster drills to live. That is, the salinity is already great enough in every area of the oyster planting grounds for the oyster drills to survive. Any changes that would be made by a diversion, according to the New York plan, would change that salinity so little that it would be a small part of the natural di-

version, and also it would still leave all that area salty enough for the oyster drill to work, as it is now. They have now a great enough salinity for the oyster drill to work, and they would hereafter.

"Then, as to the oyster seeding areas, the diversion from New York might shift the salinity death limit for the drills, as testified in this case, a slight distance upstream, in a theoretical case, but the natural (6131) variations are, as I say, from ten to thirty times as great as the artificial change it would make.

Mr. Morgan also said (p. 6156):

"Now, having observed that the oysters at home met that great range, we felt that the artificial range of seldom as much as one part per thousand—the experts here estimated 0.4 of a part per thousand—that that small range would have practically no effect upon the industry.

"That was also supported somewhat by the general opinion of the oyster raisers that as to the natural feed beds they got their best seed oysters from the region of greater salinity, and their poorer seed oysters from the region of lesser salinity. So that as far as their seed oysters are concerned an increase (6157) of salinity would be an advantage to them."

I set out also in full the opinion of Dr. Federighi, as it is in compact form and as he appears to have made a very careful analysis of the effect of the diversion (Ex. Penna. 424):

"The effects of the diversion of fresh water from the Delaware River on the oyster industry of the Lower Delaware Bay are undoubtedly difficult to determine from the scant data available. The State of New Jersey has arrived at certain conclusions as to the effect of this diversion on the oysters in Delaware Bay. A study of this information shows that the data are subject to other equally sound conclusions. In the following are given these interpretations in a somewhat brief form.

"The problem is essentially one of animal adaptation. Can the oysters adapt themselves to environmental changes? Necessarily any change in environment disturbs the balance of living things, but

fortunately organisms have a great flexibility and are capable of withstanding extreme changes in environment. The withdrawal of freshwater will have one important effect. It will cause a change in the salinity of the waters of the upper bay, and this change will be towards an increase in the salt content of the water.

"The effect produced on the adult oysters by a slight increase in salinity is insignificant. The planted areas from which most of the oysters come are located on bottoms having a higher salinity than the natural beds and on bottoms which do not naturally propagate (Nelson, p. 2809, of N. J. testimony). These beds, the outcome of man's efforts, are proof of the adaptability of the oyster to salinity changes. If the oyster were incapable of any adjustment, then the removal of the oysters from the more brackish natural beds to the more saline planted areas would have been useless, because the oysters would have been unable to survive. Such a transplantation from brackish to saline water is not different from a removal of fresh water. In one case you move the animal dowstream; in the other, the salinity moves upstream. If salinity is considered a decisive factor, then the above plan of water diversion will have no greatly pronounced effect on the present oyster beds.

"New Jersey further claims that increased salinity on the seed-producting areas will destroy them, or at least move them from their present locality (Nelson, p. 2929, N. J. testimony). The gradual increase in the size of the beds in this area, notably Bennie's Bed, indicates that the oyster larvae have been able to adapt themselves to not only lower salinity, but higher salinity. This is shown by the fact that the bed has extended not only upstream, but downstream. (Mott, p. 3125, N. J. testimony; Fowler, p. 3143 and p. 3140, N. J. testimony.) One other point in this regard—Nature produces from any batch of eggs individuals not only fitted for the environment as it is, but individuals which survive only in a different environment. I think this is a conclusion accepted by most biologists. How does this apply? Briefly, something like this might happen. From the enormous number of eggs produced by one female oyster, only a few ever reach the spat stage. Why is this number so small? There are several reasons: natural enemies feed on some, others

never reach a favorable substratum, and still others never develop because the environment is unsuitable. It is not unreasonable to believe that some of those that do not survive, die because of unfavorable salinity. The increase in salinity (very slight in any case) might kill the larvae which are suited for the present environment. These would be replaced by those which at present find the water too fresh for survival. This is significant because the seed oysters remain on these natural beds rarely over a year. It is evident then that the new seed, produced under more saline conditions, would be better suited for transplantation lower down the bed where, there too, an increase in salinity has taken place. This is not absolutely necessary for the survival of the oysters on the planted areas, because in many cases the seed comes from areas having a great difference in salinity from that on the planted areas, again indicating the remarkable adaptability of the oyster seed.

"The presence of the large body of less saline water off Delaware Bay insures the oysters plenty of time for their adjustment to any permanent salinity change. These data indicate that the change will certainly be a slow one and a small one.

"The oyster adapts itself to water of varying salinities as is shown by the fact that they are found naturally in water having salinities from approximately 14 to 30 parts per thousand. How this great range of adaptability is brought about seems to be due to selection rather than survival, although the latter may be the mechanism. In this regard I want to call attention to my paper on the salinity death points of the oyster drill where it is shown that the lethal salinity depends on the environmental salinity. This seems to imply that the salinity death point for a group of animals of the same species, collected from one place, does not show the limits of salinity distribution of the species, but that animals at different environmental salinity have different salinity survival ranges. To state this in another way: Oyster drills from Beaufort are killed by a salinity of approximately 16 parts per thousand. This, however, is not the lethal salinity for *all* drills, because at Hampton Roads the drills will withstand salinities as low as approximately 12 to 13 parts per thousand. In other words, the salinity limits for oys-

ters at present obtaining at Delaware Bay are not necessarily the salinity limits for the species because by natural selection a new environment may give rise to oysters having other salinity limits. Because these animals have new salinity limits, it may be said that they are not the old animals which have become adjusted (although this may be the case—see my paper) but a group derived through selection.

Before closing this question of the effect of the change in salinity on the oysters, one more thought occurs to me. Are the effects produced by the diversion of water from the Delaware River comparable to the effects produced by a dry season? It seems to me that they are not necessarily similar. During a dry season the water is derived from springs and so would have a higher salt content with little organic matter. By the diversion plan, some of the surface water which will contain organic matter will get to the oyster beds. I feel that this distinction is one having some significance.

The fact that oysters during a N E storm get "poor" (D. Robbins, p. 3031-2; C. Robbins, p. 3028) needs some criticism when applied to what would happen to them by the diversion plan. In the case of a N E storm you have a sudden and great increase in salinity to which the animal cannot immediately get adjusted. By the diversion of water there occurs a slow and small change in salinity, permitting the oysters ample time for adjustment to osmotic changes, so that there would be no shrinking nor should the oysters become poor. If the New Jersey testimony could be applied universally, then oysters from Wellfleet, Lynnhaven, Chinncoteague, etc., should all be poor, because in these localities the water has a high salinity.

The effect of this plan (New York plan) on the enemies of the oysters is given great weight by New Jersey. The claim (Nelson, p. 3004, p. 2905; Nelson, p. 4146-4161) that the increase in salinity will bring about an invasion which will destroy many acres of spat. I do not think that the small change in salinity (Thomas, p. 3083-3088) would greatly influence the movement of the drumfish and the starfish over the natural beds, because the salinity would still be too low. As far as the drill is concerned, since it is prac-

tically non-migratory (see ms.) there would be no danger. The danger with this pest is due to the careless habits of the oysterman. They are the distributors of the drill.

"Furthermore, I do not feel that salinity alone is the controlling factor in the distribution of these pests. If this were true, then you could not explain why no drills are found at Wellfleet although the salinity is over 30 parts per mile, in Long Island Sound, where the salinity is also well above the lethal salinity. It seems to me that other factors are equally important; for instance pH, currents (see my paper on the effect of currents on the oyster drill), character of bottom, and other factors of which we know nothing yet, such as, for instance, minute quantities of various substances which may be necessary for reproduction. And even though Nelson (p. 2904-5) has shown that the drills invade the seed-oyster beds during a dry season, this does not mean that the diversion of fresh water from the upper Delaware will have the same effect. The two situations and the two sets of conditions are not comparable."

From the mass of evidence on this feature of the case there can be no doubt that the diversion of water by New York will to some extent affect salinities on the oyster grounds. The oyster is a form of life which the evidence shows adapts itself to a wide range of salinities, and a change in salinity of .5 to even 1.5 parts per thousand is a small change compared to the natural changes in salinity which occur from year to year, month to month and from day to day. It is to be remembered also that the salinities are necessarily higher during the low flows in the river, that is, during the dry season and that during the very low flows there is a release of fresh water whether under the New York plan or the Pennsylvania plan. In other words, during extremely low water both the New York plan and the Pennsylvania plan will be helpful to some extent. In a matter of this kind it is to be expected that there will be wide and honest differences of opinion and, in attempting to view the matter from the common sense view-point of a

layman, I am not persuaded that the New York diversion will have the great damaging effect on the oyster industry as charged in the bill of complaint. The outstanding fact in my mind is that the oyster is now living and thriving in Delaware Bay in salinities and conditions of wide variation, that it has adjusted itself to these varying salinities and conditions and that the execution of the New York plan does not make a relatively great change in salinities and other conditions.

It is to be remembered, however, that the water diverted by New York never returns to Delaware River and Bay and that the diversion will at times increase and accentuate natural adverse variations in salinities and other conditions, except at those periods of very low flow when water is released from the impounding reservoirs. The evidence of practical oystermen as to large corps in wet years than in dry years should also not be overlooked. In the conflict of evidence as to the effect on oysters. I reach the conclusion and so find that while the New York diversion will not have the very great damaging effect claimed by New Jersey, yet undoubtedly it will have the effect of producing more than slight damage and there will result a greater damaging effect than New Jersey should be called upon to bear under the principle of fair and equitable apportionment of the waters of the Delaware.

I am further of the opinion and so find that by reducing the New York diversion and by modifying the plan of releasing water at low stages of the river, the damage to New Jersey will be so decreased that it will be slight and inconsequental.

XVIII.

THE TEREDO.

The teredo or shipworm operates in salt water and is destructive of wooden ships, piling and wooden structures generally. Evidence was introduced to show that the salinity of the tidal section of the Delaware River would be

increased so as to extend the area in which the teredo could operate.

I find that the effect of the operation of the New York plan, particularly as modified herein, will so slightly affect the salinities and areas in which the teredo can operate that any damage resulting from this source will be inconsequential.

There is no allegation in the bill as to damage by teredo but I mention this matter as it was made the subject of some proof.

XIX.

DEVELOPMENT OF WATER POWER BY NEW YORK CITY.

Some question was made as to the right of the City of New York making the proposed diversion on the ground that the water diverted would be used not merely for municipal water supply but to develop water power which would be sold at a profit. This feature of the case was not particularly stressed.

I find on the proof that the proposed diversion by New York City is for the purpose of municipal water supply and that any development of water power will be a pure incident.

In the report of the Chief Engineer of the Board of Water Supply of June 10, 1927 (Exhibit 4 on the development of the tributaries of the Delaware he says:

> "At the West Branch reservoir, on the Croton watershed, there will be available a drop which may be utilized for the development of hydro-electric power. It is estimated that, upon the completion of the second stage of the proposed development, there can be generated at this point, as practically continuous 24-hour power, not less than 25,000,000 kilowatt-hours per annum. The estimated return to the city on account of this power, after allowing for maintenance, operation and carrying charges on the necessary construc-

tions, should be not less than $150,000 per year. As a possible alternative to the sale of this power, there is the possibility that in the future it may become desirable to use this energy for pumping practically all of the Croton water as well as water from the East Side Hudson sources for delivery into Kensico reservoir. These alternatives cannot now be definitely evaluated."

It appears in the proof that the water to be diverted from the Delaware tributaries or some of it can be used without waste so as to develop hydro-electric power. This is a mere by-product of a gravity water supply and is a pure incident. The development of some hydro-electric power by reason of the existence of a gravity supply of water does not change the nature of the taking by New York. The real purpose of the New York taking is municipal water supply. If consistent with the use of the water for municipal supply and without loss of municipal supply, the water in its passage to the city can be used for development of power, I see no legal objection to such development.

XX.

THE FEDERAL WATER POWER ACT.

Paragraph 47 of the bill is as follows:

"45. Said proposed diversion will result in great damage to the vested rights and property of the plaintiff and its citizens, for the compensation of which there is no provision or remedy at law, either through proceedings in condemnation or otherwise. Said proposed diversion, if carried out as now threatened by the defendants, will cause great and irreparable damage to vested rights and property of the plaintiff and its citizens for the prevention of which there is no means or remedy save by injunction issued out of this Honorable Court."

I am unable to find any substantial merit in this allegation of the bill. Indeed, this paragraph of the bill is answered by Section 27 of the Federal water power act.

Section 27 (Title 16 United States Code, Section 821) provides:

> "Sec. 281. State laws and water rights unaffected. Nothing contained in this chapter shall be construed as affecting or intending to affect or in any way to interfere with the laws of the respective States relating to the control, appropriation, use, or distribution of water used in irrigation or for municipal or other uses, or any vested right acquired therein." (June 10, 1920, ch. 285, Sec. 27, 41 Stat. 1077.)

I have already found that the proposed impounding dams are on intrastate rivers in the State of New York and at points on said rivers where they are not navigable. I have also already found that the navigable capacity of the Delaware River will not be adversely affected by the proposed New York diversion.

In view of the provisions of Section 27 just quoted, I am unable to see how the taking of water from streams of the character just referred to would violate the Federal water power act. This act was recently considered in *New Jersey* v. *Sargent*, 269 U. S. 328. See also *Alabama Power Company* v. *Gulf Power Co.*, 283 Fed. 606, wherein Section 27 of the act is construed and wherein it was held that the words "other uses" in Section 27 were to be construed *ejusdem generis* with the words "irrigation" and "municipal".

XXI.

WHETHER THE STATUTE LAW OF THE STATE OF NEW YORK HAS BEEN COMPLIED WITH RELATIVE TO NEW YORK CITY OBTAINING PERMISSION OF THE STATE OF NEW YORK TO MAKE THE PROPOSED DIVERSION.

Under the law of New York, Section 521, Article XI New York Conservation Law (Exhibits 2 and 3, p. 57.) no municipal corporation has power to acquire a water supply or an additional water supply or to take or condemn lands for any water supply until the plan of such municipal corpora-

tion, including maps, profiles, etc. have been submitted to the Water Power and Control Commission of the State. The statute also provides for a public hearing by the said commission after notice being given of the time and place of such hearing and, at such hearing, it is required that all persons, municipal corporations or others who may be affected shall be heard. Section 523 of the Conservation Law provides:

> "The commission shall within ninety days after the final hearing and with all convenient speed either approve such application, maps and plans as presented or with such modifications . . . as it may determine to be necessary . . . or it may reject the application entirely . . . Whenever the commission shall make a decision on any application submitted to it, it shall state the same in writing, and shall cause the same to be filed, . . . in the office of the commission."

In accordance with the provisions of the New York law a public hearing was held in the Ulster County Court House in the City of Kingston, February 28, 1928 and, according to the statement of the memorandum of the Water Power and Control Commission, "was closed on that day".

It is the contention of New Jersey that as the approval of the commission was not given until May 25, 1929, there has not been compliance with the portion of the Conservation Law above quoted, as the approval of the commission was not given within ninety days after February 28, 1928 and, indeed, not until May 25, 1929.

It appears, however, that the Commission desired legal advice and awaited the opinion of counsel before final action. The opinion of counsel was not furnished until April 18, 1929, and the approval of the New York plan was given on May 25, 1929, or within less than ninety days after the opinion of counsel had been furnished.

I think too narrow a view should not be taken of the meaning of the expression "final hearing" as contained in the Conservation Law. While the hearing at Kingston, at

which parties appeared in person or by counsel and made their objections, was concluded on February 28, 1928, I think it is quite within a rational purview of the statute that the final hearing did not take place until the opinions of counsel were filed with the commission. No New York decision construing this portion of the New York Conservation Law has been brought to my attention. My own opinion is that it should be given a liberal and not a narrow construction. But however that may be, I am of the opinion that the question raised by New Jersey is not one which New Jersey has the right to make. I do not think it can be made in this collateral way, particularly as New York state is a party to this litigation and has appeared by its Attorney General and its Assistant Attorney General and they take the position that the New York law has been complied with. As, therefore, New York state is satisfied that all procedural law relative to water supply has been complied with, I think that ends the question, and that no other state can properly insist that New York state has erroneously decided that the procedure in this particular matter is in accord with New York law.

XXII.

VIOLATION OF THE CONSTITUTION OF THE UNITED STATES.

Paragraphs 48, 49 and 54 of the bill of complaint read as follows:

> "48. Said proposed diversion will interfere with and regulate the interstate commerce of the plaintiff and its citizens in violation of Article I, Section VIII, paragraphs 3 and 18 and Article VI, paragraph second, of the Constitution of the United States.
>
> "49. Said proposed diversion will take the property of the plaintiff and its citizens without due process of law, in violation of Article XIV, Section 1 of the Constitution of the United States.
>
> "54. Said proposed diversion will create and give a preference to the port of the City of New York, over

that of the City of Trenton and other ports of the plaintiff on Delaware River and Delaware Bay, in violation of Article I, Section IX, paragraph 6 of the Constitution of the United States."

The record does not disclose any substantial basis for the claim that the operation of the New York plan will regulate interstate commerce, or that it will have the effect of preferring the ports of New York to the ports of New Jersey. Any possible claim which could be made under the Fourteenth Amendment is eliminated by the modification herein made of the New York plan of diversion.

XXIII.

THE PENNSYLVANIA INTERVENTION.

The State of Pennsylvania was permitted to intervene in this cause "upon the condition that the State of Pennsylvania shall file a statement of her interest in this cause and of the relief, if any, which she seeks". In pursuance of this order of the Court, Pennsylvania filed a statement of its interest and the relief desired by it. The relief desired by it is thus stated in the pleading entitled "Statement of Interest and Relief Desired by the Commonwealth of Pennsylvania, Intervenor":

> "The Commonwealth of Pennsylvania will desire relief at the hands of this Court against the project of the City of New York, if upon the hearing of this cause it develops
>
> "(a) That the proposed impounding and diversion will not be in accordance with a fair and equitable division of the waters of the Delaware River and its tributaries between the States of New Jersey and New York and the Commonwealth of Pennsylvania;
>
> "(b) That the project of the City of New York does not contemplate a proper release of impounded flood waters for the purpose of increasing the low water flow of the Delaware River;
>
> "(c) That the proposed impounding and diversion will work material damage to the present or reasonable future interests and needs of the Commonwealth

of Pennsylvania, its municipalities and its inhabitants to the waters of the Delaware River and its tributaries for domestic and municipal water supply and sanitation, industrial water supply and the development of water power;

"(d) That the adjudication proposed by either of the parties to the litigation should leave the State or City of New York free to pursue any unrestricted plan of impounding and diversion;

"(e) That the adjudication proposed by either of the parties in this cause should foreclose the Commonwealth of Pennsylvania in the future from insisting that the project now to be carried out by the City of New York shall constitute a prior appropriation which shall be taken reasonably into account in any subsequent or final allocation of the waters of the Delaware River and its tributaries between the States of New Jersey and New York and the Commonwealth of Pennsylvania."

In the brief of Pennsylvania filed with me there occurs the following statement of the position of Pennsylvania:

"The Commonwealth of Pennsylvania has no objection to a present allocation of 600 m. g. d. by this Court to New York City and State. After a full consideration of all the facts the Intervenor has reached the conclusion that this amount does not exceed their fair and equitable share in the waters of the upper Delaware River and will not cause any substantial damages to its interests, if taken pursuant to the Pennsylvania plan of impounding and release.

"Pennsylvania insists, however, that an award by this Court to New York City and State shall not constitute a prior appropriation because this would render nugatory the doctrine of apportionment and institute at once a wasteful tri-state competition for the waters of the Delaware river. To hold otherwise would mean that New York City and State would be given by this Court a preferred position regarding this water supply, which judicial holding would produce a state of affairs intolerable to the Commonwealth of Pennsylvania and contrary to the attitude and position assumed by New York City and State throughout the present proceedings." (pp. 64-5.)

And in the argument of the Attorney General of Pennsylvania before me the following further statement of the position of Pennsylvania was made, the first paragraph of the statement having reference to whether the common law rule of riparian rights should apply or whether the rule of equitable apportionment should apply:

> "So that Pennsylvania comes here in a dual capacity. We stand here as defendant when it comes to consideration of the rule which should apply to the question of using water for water supply from the Delaware River.
>
> "We come here as a plaintiff to the extent, but only to the extent, of asking that New York's taking water at this time shall be so surrounded with proper conditions as to safeguard the interests of our State in the future."

At the conclusion of the Pennsylvania brief, the following five propositions are contended for:

> "1. The waters of the Delaware River and its tributaries should be fairly and equitably apportioned among the three states according to their present and reasonable future needs;
>
> "2. The City of Philadelphia and Eastern Pennsylvania should be presently allotted 750 m. g. d. from the Pennsylvania tributaries of the upper Delaware River as their fair and equitable share in the waters of that river;
>
> "3. Any present allocation of Delaware River to the State and City of New York should not constitute a prior appropriation but should be chargeable against their fair and equitable share in said waters;
>
> "4. The Pennsylvania plan of impounding and release should be adopted because it is the best plan under all conditions of taking and permits all three states to take their fair and equitable share in the waters of the Delaware River and its tributaries, when and as required, without causing substantial damages to any interests; and
>
> "5. A Delaware River Master should be appointed in order that the Pennsylvania plan of impounding and release may be more effectively operated." (p. 237).

It is insisted by the plaintiff that the position taken by Pennsylvania, as set out above, is not in accordance with Federal Equity Rule 37, as Pennsylvania is taking the status of both a plaintiff and defendant. Rule 37 in part provides:

> "All persons having an interest in the subject of the action and in obtaining the relief demanded may join as plaintiffs, and any person may be made a defendant who has or claims an interest adverse to the plaintiff. Any person may at any time be made a party if his presence is necessary or proper to a complete determination of the cause. Persons having a united interest must be joined on the same side as plaintiffs or defendants, but when anyone refuses to join, he may for such reason be made a defendant.
>
> "Anyone claiming an interest in the litigation may at any time be permitted to assert his right by intervention, but the intervention shall be in subordination to, and in recognition of, the propriety of the main proceeding."

The above rule, as I understand, applies to proceedings in District Courts, and not to original actions in the United States Supreme Court. However, assuming that the rule applies to original actions in this court I do not think it helps plaintiff.

Pennsylvania has been permitted by the court to intervene upon filing a statement of its interest and the relief which it seeks and this it has done. There has been no motion or other proceeding to challenge the sufficiency of the Pennsylvania pleading or its compliance with rule 37 and I therefore assume that Pennsylvania is entitled to contend for any of the relief prayed for by it in the pleading filed in this court entitled "Statement of Interest and Relief Desired by the Commonwealth of Pennsylvania," but not for any relief outside of that pleading. Furthermore, I do not think that this equity rule should be narrowly interpreted in a controversy of this kind where great public interests are involved.

Pennsylvania was allowed to cross-examine the witnesses introduced by New Jersey, New York State and New York City and to introduce witnesses and proof of its own. The proof of Pennsylvania tended to confirm the proof of the State and City of New York, to the effect that the taking of the equivalent of 600 million gallons daily by the City of New York would not be injurious to New Jersey.

Pennsylvania also introduced proof tending to show that in addition to the taking of 600 million gallons daily by New York, Pennsylvania could also take 750 million gallons daily and New Jersey 400 million gallons daily from the Delaware and its tributaries without injury to New Jersey or to any other State or person.

And the proof of Pennsylvania also tended to show that Philadelphia and Eastern Pennsylvania would by 1980 have need of 750 million gallons daily from the Delaware River and its tributaries for purposes of municipal water supply. The proof of Pennsylvania, however, failed to show that there was any officially authorized plan or any definite project for the taking by Philadelphia and Eastern Pennsylvania of 750 million gallons daily, and New Jersey disclaimed as gratuitous the suggestion that it be allotted 400 million gallons daily from the Delaware and its tributaries.

The proof of Pennsylvania further tended to show that it was probable that Eastern Pennsylvania and Philadelphia would have to resort to the Delaware and its tributaries for additional water supply on account of the unsatisfactory supply at present existing.

I shall now take up the five propositions contended for by Pennsylvania at the conclusion of its brief. The first proposition is:

> "1. The waters of the Delaware River and its tributaries should be fairly and equitably apportioned among the three states according to their present and reasonable future needs".

I have already decided that the principle of fair and equitable apportionment is the principle which I have ap-

plied in the decision of this case, and that such principle is in accord with interstate common law.

The second proposition is as follows:

> "2. The City of Philadelphia and Eastern Pennsylvania should be presently allotted 750 m. g. d. from the Pennsylvania tributaries of the upper Delaware River as their fair and equitable share in the waters of that river."

I do not find that the relief asked for in this proposition is embraced within the statement of relief set out in the pleading entitled "Statement of Interest and Relief Desired". In short, Pennsylvania is asking for an adjudication not embraced within the scope of its pleading. Putting that objection, however, out of view, I find there is another and, I think, insuperable objection to granting the relief for a present allocation to Pennsylvania of 750 million gallons daily. This objection is one of jurisdiction. Pennsylvania is, in substance, asking for a declaratory judgment of its rights.

There is no present or definite project on the part of Pennsylvania or the City of Philadelphia to resort to the Pennsylvania tributaries of the Delaware River for an additional water supply. It is entirely true that there was much proof to show the dissatisfaction of the people of Philadelphia and the Philadelphia metropolitan area with the existing water supply. The existing water supply comes from the Delaware River at Philadelphia and from the Schuylkill River at Philadelphia. Indeed, on account of the fear of and danger of pollution of these streams at this point, there is required an extensive and expensive treatment and purification before the water is delivered to the city water mains for consumption. There was also proof showing that Philadelphia has only a three-days water supply.

Mr. Robert Spurr Weston, a prominent sanitary and water supply engineer of Massachusetts testified on behalf of the Commonwealth of Pennsylvania as follows:

"Q. You have testified regarding this rapidly growing suburban district in the immediate neighborhood of Philadelphia. How will that affect the present sources of water supply for the Philadelphia Suburban Water Company?

"A. I think ultimately some of the sources will be overgrown. Some may be used indefinitely. Some will be abandoned when it is good business and economy to do so.

"Q. Have you given consideration to the Perkiomen as a possible source of supply for Philadelphia and the metropolitan area?

"A. Yes, sir.

"Q. Is it in danger of pollution?

"A. No. The Perkiomen may be termed, I think, a good upland source. I should think the natural tendency would be to take that on to replace the most objectionable of the Philadelphia sources. That is, if the Schuylkill were abandoned, they would naturally go to the Perkiomen. There are other small supplies in the district which may be used for quite a little time. They are small, however.

"Q. Then, in your opinion, it is only a question of time when the nearby sources will have to be largely abandoned, and Philadelphia and the metropolitan area must go to the Upper Delaware for their source of supply?

"A. I think that is true, following the experience which we have had, particularly in Massachusetts, and which has been the experience in New Jersey. The sources of water supply move upstream to better and cleaner places." (Rec. pp. 5498-9.)

The Perkiomen is a tributary of the Schuylkill.

Mr. Solomon M. Swaab, a distinguished consulting engineer residing in Philadelphia, and a former Vice-chairman of the Water Commission of the City of Philadelphia, testified as to the need of Philadelphia ultimately resorting to the tributaries of the Delaware River for an additional and better water supply. Mr. Swaab testified that Philadelphia and the eastern area of Pennsylvania north of Philadelphia would need by 1980 as much as 750 millian gallons of water daily, and that in his opinion it would be necessary for

Philadelphia ultimately to abandon its present water supply, which is taken direct from the Delaware and Schuylkill Rivers at Philadelphia and go to upland sources, that is, the upper tributaries of the Delaware River in the State of Pennsylvania. Mr. Swaab said:

> "Q. In your opinion, will it be necessary for Philadelphia to abandon its present supply from the Schuylkill and Delaware Rivers and go to upland sources?
>
> "A. I feel that just as soon as the City is financially able to do so they ought to make a start. We have been talking about this thing for many years and doing absolutely nothing in that direction.
>
> "Q. What is the basis of your opinion?
>
> "A. The Delaware and Schuylkill valleys are naturally the main drainage channels throughout this territory; and there is always the liability to accidental pollution, in spite of the fact that these two rivers have been up to the present time wonderfully cleared of the matter of sewage and manufacturing waste". (Rec. pp. 5654-5.)

From this and much other evidence of similar character, while it definitely appears and I so find that there is great dissatisfaction with the present water supply of the City of Philadelphia and that qualified engineers and experts have recommended that Philadelphia resort to upland sources for a purer supply, yet, as heretofore stated, I do not find that there is any definite project or definite plan of Philadelphia to resort to the Pennsylvania tributaries of the Delaware River.

The situation is entirely different so far as New York City is concerned. New York City, acting under the authority of the State of New York, has obtained permission from the Water Power and Control Commission of the State of New York to resort to the tributaries of the Delaware River, and is proceeding to carry out its plan.

No application of Philadelphia is pending in Pennsylvania, similar to the one made by New York to the Water Power and Control Commission of New York, nor has there been authorized any such application.

While I entirely agree with the soundness of the reasons stated by Mr. Swaab and Mr. Weston as to why the City of Philadelphia may ultimately have to resort to upland sources for a supply of water (and included in those upland sources are the Pennsylvania tributaries of the Delaware River), yet I do not think that mere possibility of Philadelphia's resorting to the tributaries of the Delaware furnishes a basis for the court now to allot 750 million gallons daily as the fair and equitable share of the City of Philadelphia and Eastern Pennsylvania in the tributaries of the Delaware. The request of Philadelphia and Pennsylvania substantially is "we will possibly and indeed probably desire in the future to resort to the tributaries of the Delaware River as a source of water supply and we, therefore, now, wish an adjudication that 750 million gallons daily is a fair and equitable quantity of water for us to take". As there is no actual effort or any officially authorized plan to take 750 million gallons from the tributaries of the Delaware, there is no "case" or "controversy" to which the judicial power of the court extends. Article III Section 2 of the Constitution of the United States. *Liberty Warehouse Co.* v. *Grannis,* 273 U. S. 70, *Muskrat* v. *United States,* 219 U. S. 346. See also the recent case of *Piedmont and Northern R. R. Co.* v. *United States,* 280 U. S. 469, where it is said that a declaratory judgment "is not within either the statutory or equity jurisdiction of federal courts".

I am of the opinion, therefore, and so hold that I am without authority and jurisdiction to allot 750 million gallons daily from the Pennsylvania tributaries of the Delaware River to Philadelphia and Eastern Pennsylvania, and that relief is denied without prejudice.

The third proposition above contended for is as follows:

> "3. Any present allocation of Delaware River water to the State and City of New York should not constitute a prior appropriation but should be chargeable against their fair and equitable share in said waters."

I think this proposition is sound. I do not think that the mere fact that the State and City of New York are first in point of time in taking waters from the tributaries of the Delaware River gives any superiority of right. While the doctrine of priority of appropriation is applied in some of the arid states of the west and is part of the public policy of such states, I find no such principle obtaining in New York, New Jersey, or Pennsylvania. The meaning of priority of appropriation is explained by this court in *Wyoming* v. *Colorado,* 259 U. S. 470. In that case the court said:

> "The cardinal rule of the doctrine is that priority of appropriation gives superiority of right."

I therefore adopt as correct Proposition No. 3 as above stated.

The fourth proposition is as follows:

> 4. "The Pennsylvania plan of impounding and release should be adopted because it is the best plan under all conditions of taking and permits all three states to take their fair and equitable share in the waters of the Delaware River and its tributaries, when and as required, without causing substantial damages to any interests".

I have adopted the principle of the Pennsylvania plan of releases and have applied it to the extent that New York is permitted to take water from the New York tributaries of the Delaware River. In other words, I have superimposed upon the quantity of water which New York is allowed to take, the principle of the Pennsylvania plan of release. That is as far as I have authority to go. There is not before me any project or plan of Pennsylvania and Philadelphia to take water from the tributaries of the Delaware River; nor is there any project or plan of New Jersey for the taking of waters from the New Jersey tributaries of the Delaware River. Indeed, New Jersey disclaims any such present intention. I am without authority to enter a declaratory judgment that the Pennsylvania plan of im-

pounding and release shall be applied to Pennsylvania and New Jersey, if and when those states take water from the tributaries of the Delaware River. There is no actual case or controversy as to Pennsylvania or New Jersey taking waters from the tributaries of the Delaware River and, in the absence of an actual case or controversy, I deny without prejudice the application (if such application be intended) that the Pennsylvania plan of impounding and releasing shall be applied to Pennsylvania and New Jersey if and when those states adopt plans for taking water from the Delaware or its tributaries.

The fifth proposition of Pennsylvania is as follows:

> "5. A Delaware River Master should be appointed in order that the Pennsylvania plan of impounding and release may be more effectively operated."

This proposition is beyond the scope of the relief asked in Pennsylvania's pleading. Independent of this consideration, however, I consider this proposition premature. It may or may not be advisable at some time to appoint a river master. There is no occasion for the consideration of this matter at this time. There is no taking by New York at present from the tributaries of the Delaware River. Under the proof in this case, it will probably be ten years before there is any taking by New York from a tributary of the Delaware. I am not convinced that even when taking is begun that the appointment of a river master will be necessary. That is left to the future for determination. I have no reason to doubt that New York State and City will faithfully observe the terms of the decree of the court specifying the conditions of taking water from the tributaries of the Delaware, and whether those conditions should be changed or a river master appointed should be left for future determination. However, if conditions should hereafter arise to justify the appointment of a river master, an application can then be made. (*Montezuma Canal Co.* v. *Smithville Canal Co.*, 218 U. S. 371.) At present, I consider the matter premature. The application for

the appointment of a river master is, therefore, denied without prejudice.

XXIV.

GENERAL CONCLUSION.

The items of damage which New Jersey claims that it will suffer by reason of the proposed New York diversion have been considered separately. These items should now be considered as a whole. I have found that the execution of the New York project would cause slight damage to navigation, agriculture, municipal water supply, shad fisheries and industrial uses of the Delaware River, and would cause more than slight damage to the recreational uses of the river and to the oyster industry. However, adding all of these elements of damage together gives a total of substantial damage and, in my opinion, more than New Jersey should be expected to bear under the principle of fair and equitable apportionment. Furthermore, the flow of a large river undoubtedly bears a substantial relation to the health and welfare of those living within its watershed and I do not think the taking by New York should be so great as to leave to New Jersey merely that flow which seems to meet its present absolute necessities. As said by this court in *Hudson County Water Company* v. *McCarter*, 209 U. S. 357; "The legal conception of the necessary is apt to be confined to somewhat rudimentary wants and *there are benefits from a great river that might escape a lawyer's view.*"

Weighing and appreciating the evidence as a whole, I reach the conclusion and so find that the proposed draft of of New York City of the equivalent of 600 million gallons daily is excessive and that this draft should be reduced to the point where it is clear that the amount permitted to be taken will not inflict substantial damage on New Jersey or its citizens and will not deprive New Jersey of any greater part of the enjoyment of the benefits of the river than that

state should be expected in all equity to yield to the other states which have a common interest in the river along with New Jersey.

This matter has been one of the utmost solicitude on my part and has given me the greatest anxiety. On the one hand, New Jersey and its more than four million people should not be unreasonably injured and, on the other hand, New Jersey should not be given the monopoly of the stream which the application of the strict doctrine of common law riparian rights would give. Again, on the one hand, New York should not be denied the right to obtain for the nearly seven million people of New York City the use of the best, purest, most dependable and most economical water supply from sources within its own boundaries and jurisdiction and, on the other hand, the taking from such supply should not be so great as to unreasonably injure New Jersey or be more than the fair share to which New York is entitled under the principle of fair and equitable apportionment.

New York and New Jersey have the same equality of right under the Constitution.

If the two states were not members of the Union and were totally independent, the use of the waters of the Delaware would be the subject of diplomatic negotiations or, negotiations failing, the states would probably go to war to settle their differences, but as members of the Union and merely quasi-sovereigns, neither course is now open. As said by the court in *Rhode Island* v. *Massachusetts*, 12 Pet. 726: "Bound hand and foot by the prohibitions of the Constitution, a complaining state can neither treat, agree, or fight with its adversary, without the consent of Congress".

New Jersey has resorted to the only tribunal open to it and, in view of the millions of people whose welfare is involved, the decision of this case is a matter of the gravest responsibility and solemnity. A court has no power to make a contract for the parties.

On the other hand, a court of equity has the power to so mold and frame its decree as to meet the exigencies and

equities of the situation, and to attach conditions to the granting or denial of injunctive relief.

The decree will apply to future conditions, and I think therefore the decree should possess some degree of flexibility.

It is therefore necessary to proceed with caution. Otherwise, irreparable injury may be inflicted on some party, or perhaps all the parties to the case.

The New York plan is divided into three stages; first, the development of the Neversink; second, the development of the East Branch; and third, the development of the Little Delaware, the Willowemoc and the Beaver Kill.

After careful and painstaking consideration of all the evidence, I see no objection to permitting New York to carry out the development of the first stage of its plan, and also the second stage of its plan. I think the third stage, should be enjoined. The first and second stages involve the taking of 440 million gallons daily and the third stage 160 million gallons daily. I am excluding from consideration the Rondout as it is not a tributary of the Delaware, but of the Hudson, and not involved in this case.

Mr. Merriman, the chief engineer of the Board of Water Supply of the City of New York, states that it will take seven or eight years to complete the first stage, and seven or eight years after that to complete the second stage.

The matter of releasing water from the impounding reservoirs is a very important one, as it is contemplated that these releases will be made at times of low flow and will thereby be helpful to the stream. I have already explained the difference between the New York plan of releases and the Pennsylvania plan of releases and have expressed my preference for the Pennsylvania plan as it is based upon the stage of the Delaware River and not upon the water yield of the diversion area. The Pennsylvania plan fixes .50 c. s. m. at Port Jervis and Trenton as the control figure to determine when releases should be made. Whenever the river falls below .50 c. s. m. at Port Jervis

(the equivalent of a flow of 1535 c. f. s.), or below .50 c. s. m. at Trenton (the equivalent of a flow of 3400 c. f. s.), or below .50 c. s. m. at both points, then, in that event, releases shall be made from the impounding reservoirs so as to restore the flow to .50 c. s. m., provided, however, the amount to be released does not exceed 30% of the water yield of the diversion area, and as the water yield of the diversion area is 2.2 c. s. m., the maximum release (30%) will be .66 c. s. m., and in a diversion area of 440 square miles (the completion of the second stage) a release of .66 c. s. m. multiplied by 440, gives a maximum release of 290.4 c. f. s.

Not only is the quantity of releases a very important one but equally important is the definite ascertainment of the time of transit of the released water from the impounding reservoirs to Tri-State Rock. I have already stated the conflict of evidence as to the time of transit and my reasons for adopting, for the present, the Pennsylvania time of transit and that in my opinion the final determination of the quantity of water to be released and of the time of transit at various stages of flow must be left to the test of actual practice and experience. No harm will be done, however, by adopting the Pennsylvania plan of release for the present and testing that plan during the operation of the first development and before the second development becomes effective.

Only 70 million gallons daily are to be diverted from the Neversink and this diversion will be in operation for a number of years before the larger diversion from the East Branch. During the operation of the Neversink diversion it can be determined with more accuracy than can now be forecast whether the Pennsylvania plan should remain as it is or whether it should be modified. Careful observations of the effect of the Neversink diversion will determine whether .50 c. s. m. is the proper control figure or whether that figure should be raised to .60 c. s. m., or higher. It can also be determined whether one, two or more control points should be adopted and the time of transit at vary-

ing stages of water can also be determined. With the result of this experience, the quantity and plan of releases can be determined before the East Branch diversion has begun. The diversion from the Neversink is relatively so small that any factors of error in the Pennsylvania plan of release will have no materially adverse effect. I am therefore of the opinion that the decree fixing the plan of release should be made subject to modification.

Professor Barrows, on behalf of the State of New Jersey, suggested a still different plan of release. I quote from the record as follows (p. 6650-1):

> "By Mr. Minard:
> "Q. If New York City should be permitted to take its 600 million gallons a day from the Delaware, is there, in your judgment, any practical manner of more adequately compensating for this taking than is proposed in either of those plans, New York or Pennsylvania?
> "A. Yes, sir.
> "Q. Will you explain?
> "A. If when water is taken for municipal use from the Delaware River it be required that a full development by storage up to approximately 2 c. s. m. be made, one-half of which is to be used for municipal supply, and the other half for increasing and maintaining a regulated flow in the river downstream, the resulting conditions would be impaired as little as may be under the assumed diversion."

The meaning of this is that New York City should so increase the storage capacity of its reserviors that it would be able to release into the stream one gallon of water for every gallon of water diverted to New York City. This plan of Prof. Barrows came into the case at a late stage and on the hearing of the rebuttal evidence. It seems to me that this plan imposes an unnecessarily heavy burden. It was testified by Mr. Merriman, who has given a most careful, intelligent and intensive study to the problems of this case, that it would bar any development by New York City so far as the Delaware tributaries are concerned. I

shall not pursue this plan of release further, as Prof. Barrows, with the frankness and candor which he exhibited in his evidence throughout the hearing, stated that he had not had opportunity to go into the details of the plan suggested by him.

It may develop in the end that the appointment of a river master is advisable, as was done in the case of *Montezuma Canal Co.* v. *Smithville Canal Co.*, 218 U. S. 371. I can understand that perhaps a river master who gave his entire time to studying daily conditions of rain fall and river flow in the Delaware watershed would be able to determine the time and extent of releases of water better than could be arranged by any fixed plan. As already stated, however, the matter of the appointment of a river master is premature and the application for such appointment should be dismissed without prejudice.

New York City seems to be prepared to comply with such changes as may hereafter be made in the quantity of water to be released or in the time and plan of releasing. Any such change as may be necessary can be complied with by either increasing the storage capacity of the reservoirs which are contemplated to be built or by building additional reservoirs on other tributaries of the Delaware for the purpose of storing water, which would be used only for release into the Delaware watershed.

I have already stated that New York City should also be required to treat the sewage and industrial waste at Port Jervis and, indeed, in its brief it has offered to do this.

There should also be the requirement that the accredited representatives of Pennsylvania and New Jersey should have the right at all reasonable times to inspect the dams, reservoirs and works of New York City and also the right to inspect all meters and other apparatus and all records pertaining to the inflow or outflow from the reservoirs, including the diversion to the New York City water supply.

In reaching the conclusions herein stated I realize that

it will be necessary to retain the cause in court for the consideration of applications which may be made for the modification of the decree in the particulars, in which I have indicated that the decree should have flexibility and susceptibility of modification. Of course, it is desirable that all questions should be settled and that litigation should be ended, but in a case of this kind in which the future is necessarily fraught with uncertainties and in which the welfare of so many people is involved, I am of the opinion that justice requires that the cause should not be ended by a decree final and unchangeable in all its particulars.

I may add that I am of the opinion that New York State, as well as the City of New York, should be bound by the terms of the decree in this cause. New York State is not only a party, and a proper party, but in addition has appeared in this case by its Attorney General and Assistant Attorney General and actively aided and seconded the City of New York in all of its efforts.

XXV.

SUMMARY OF FINDINGS OF FACT AND CONCLUSIONS OF LAW.

As a matter of convenience, I have attempted to summarize in brief form the more important findings of fact and conclusions of law, without intending to supersede what has been more fully stated in the report.

1. The controversy is justiciable and the court has jurisdiction.

2. The suit is properly brought by New Jersey to protect its own interests and, as parens patriae, to protect the general interests of its people.

3. The State of New Jersey is a riparian owner of two tracts of land on the non-tidal section of the Delaware River, one tract being in the City of Trenton where its capitol buildings are located, and the other tract being a public park at Washington's Crossing, in Mercer County.

In the tidal section of the Delaware River and in Delaware Bay, the State of New Jersey is the owner of the bed of the river and bay to the thread of the channel.

4. The City of New York is not a riparian owner on the Delaware River or its tributaries, but in the proposed diversion of waters from the New York tributaries of the Delaware to the New York City water supply is acting under the authority of the laws of the State of New York and with the approval and aid of the State of New York.

5. The common law rule of riparian rights prevails in New Jersey. The same rule prevails in New York except on the Hudson and Mohawk Rivers. The same rule prevails in Pennsylvania except on the Delaware, Susquehanna and other large rivers.

In Pennsylvania the riparian owner on the non-tidal section of the Delaware River does not own the bed of the river to the thread of the channel, but the ownership of the bed of the river is in the state.

6. New York and New Jersey have heretofore authorized the diversion of water from one watershed to another, particularly for canal purposes. Pennsylvania has authorized diversions of water for a long distance from one point on the Delaware River to another point. The public policy of the three states, therefore, cannot be said to be opposed to diversions from one watershed to another, though the diversion involved in this case is greater than any diversions heretofore authorized.

7. One of the main controversies in the case is whether the case should be decided under the common law rule of riparian rights or under the rule of equitable apportionment.

In suits between states (heretofore decided by this court) relative to the diversion of waters, there has been built up a system of law denominated as "interstate common law", and under principles of interstate common law, the rule of fair and equitable apportionment is to be applied under the facts of this case rather than the common law rule of riparian rights.

8. The Delaware River is a stream in which New York, New Jersey and Pennsylvania have a common interest and no one state is entitled to a monopoly of the stream or to such excessive use or enjoyment of the stream or its tributaries as would cause unreasonable injury to the other states.

9. The extent to which a state may make use of the stream or its tributaries is to be determined on broad principles of equity.

10. The doctrine of priority of appropriation, which involves the thought of superiority of right, has no application and is denied so far as this case is concerned.

11. The equality of right of each state under the Constitution must be preserved and the principle of equitable apportionment fairly applied.

12. Before the court can be moved to exercise its extraordinary power under the Constitution to control the conduct of one state at the suit of another, the threatened invasion of rights must be of serious magnitude and it must be established by clear and convincing evidence.

13. In weighing and appreciating the evidence of expert witnesses whose evidence is in direct conflict, the court will examine to ascertain the care and accuracy with which such experts prepared their basic data and particularly will look for outstanding facts from which the lay mind can safely draw inferences.

14. The facts must be critically examined to determine whether New Jersey or its citizens will be unreasonably injured.

15. In the enjoyment of common property each state must yield something to other states, so that such other states may have their fair enjoyment of the common property.

16. There is a real need for New York City taking immediate steps to increase its water supply. It can obtain an additional supply from the Hudson watershed and other sources in New York State, the taking from which will not

affect any other state. The supply from such other sources, however, will not be as pure or satisfactory as the supply from the New York tributaries of the Delaware, but can be made acceptable by proper treatment. The supply from the Delaware tributaries is also less expensive.

17. The New York tributaries of the Delaware furnish the best and purest source of additional water supply for New York City, the most satisfactory supply and the most economical supply.

18. New York City, acting under the authority of New York State, should have the right to select its source of additional water supply. This is a matter which concerns the administration of its own internal affairs and should not be controlled by another state unless its plan for additional water supply is willful or arbitrary and without sound basis and unreasonably injures such other state.

19. The taking by New York City of the equivalent of 600 million gallons daily from the New York tributaries of the Delaware is not objected to by Pennsylvania but is objected to by New Jersey, though each state is affected in substantially the same way and to the same extent, except as to the claim of New Jersey of damage to its oyster industry.

20. The modern tendency is to obtain for municipal supply the purest water possible and to make this water better and not to obtain less desirable water and render it acceptable by treatment and purification, though insuperable economic considerations frequently compel the latter course.

21. The selection of the tributaries of the Delaware is not an arbitrary one and without sound reason, as the tributaries of the Delaware furnish the best and purest water available and the supply of water from that source is furnished by gravity, thereby avoiding the expense of pumping and the risk of breakdown in pumping operations, and is the least expensive, though the matter of expense is not as controlling with the Special Master as the other considerations.

22. The contention that there has been failure of compliance with the procedural law of New York in obtaining authority from the Water Power and Control Commission of the state to carry out the plan of the City of New York, is found to be without merit and, in any event, this question cannot be made in a collateral way by New Jersey—particularly as New York State, through its Attorney General, has ratified and approved the procedure which has been taken.

23. The fact that New York City may develop some hydroelectric power in the carrying out of its plan is a pure incident and not the object of the plan, and therefore not a basis for injunctive relief.

24. The Delaware River in its tidal section from its mouth to Trenton Falls is a navigable stream and is actually navigated and carries a large volume of commerce.

25. The Delaware River from Trenton Falls to Hancock, New York and beyond to undefined points in the East Branch and West Branch, was navigated during the last century and before, and carried considerable commerce. It is not now navigated for commercial purposes and is unsuited to modern methods of water transportation. The only navigation at the present time is by motor boats and canoes for pleasure purposes and for short distances. The river, however, is navigable in fact and, therefore, navigable in law under the decisions of this court.

26. The Neversink, Beaver Kill, East Branch, Willowemoc, and Little Delaware rivers are intrastate streams of the State of New York and not navigable at the points where New York City proposes to place its impounding dams.

27. The record herein discloses that the carrying out of the New York plan will have slight effect and no materially adverse effect on the navigation and navigable capacity of the tidal and non-tidal sections of the Delaware River.

28. The City of New York has not applied to Congress or the Secretary of War or the Chief of Engineers of the

United States Army for permission to make the proposed diversion, but has acquainted the War Department with its plan of diversion and the War Department has been furnished with a transcript of the proceedings in this cause.

29. The Act of Congress of May 3, 1899, relative to navigation and navigable capacity of navigable waters of the United States does not forbid slight or inconsequential obstructions to navigation or navigable capacity, but only unreasonable or material obstructions. However, the United States is not a party to this suit and any decree rendered herein relative to navigation and navigable capacity is subject to the paramount authority of Congress and the authority of the Secretary of War and Chief of Engineers of the United States Army, acting in pursuance of the Acts of Congress. The State and City of New York must take the risk of any action which the United States may see proper to take.

30. No injunctive relief can be granted on the ground of the alleged damage to New Jersey's water power rights in the Delaware, as there is no definite or authorized project for damming the Delaware River to create water power, and before any such project could be carried out, it would be necessary to obtain (1) the consent of Congress, (2) the consent of Pennsylvania and New Jersey for dams across the river between Pennsylvania and New Jersey, and (3) the consent of Pennsylvania and New York for dams crossing the river between those states. No one has applied for such consent and the evidence indicates that such consent would not be obtained. In determining whether injunctive relief should be granted, the law looks to the immediate and the proximate, and not to the remote.

31. It is a contested question of fact whether the comprehensive plan of power development suggested by New Jersey, though feasible from an engineering standpoint, would be economically sound and such as to yield a fair return on the investment. New Jersey has failed to establish by a preponderance of the convincing evidence that the

proposed development of water power is sound economically or attractive financially.

32. The Delaware River is a large stream and a relatively clean stream in the non-tidal section, with the exception of a polluted condition immediately below Port Jervis, though the effect of this pollution largely disappears before the stream reaches Delaware Water Gap. The effect of taking the equivalent of 600 million gallons daily from the tributaries of the Delaware (that is, 928 cubic feet per second) will not materially affect the sanitary condition of the river. The effect will be slight and immaterial.

33. The Delaware River is the source of water supply of Trenton, New Jersey and other New Jersey municipalities. The New York diversion will not materially affect the Delaware as a source of municipal water supply. The effect will be slight and immaterial.

34. The effect of the New York diversion on the waters of the Delaware River for industrial uses will be slight and immaterial.

35. The effect of the New York diversion on agriculture and the cultivation of New Jersey lands bordering on the Delaware River will be slight and immaterial.

36. The effect of the New York diversion on shad fisheries and the shad industry will be slight and immaterial. No definite relation has been established between high flows of the river and large catches of shad. The decline of the shad industry seems to be due more to pollution and to other causes not definitely ascertained.

37. The effect of the New York diversion on the recreational uses of the river will be to cause somewhat more than slight damage, particularly as affecting the reputation of the river as a place of recreational resort. The investment in recreational camps, hotels and other facilities is large.

38. The effect of diversion on the oyster industry in Delaware Bay will be to increase very slightly the salinity of waters over the oyster grounds and to cause somewhat

more than slight damage to the oyster industry. The value and extent of this industry are large.

39. *Totaling* all the effects of the New York diversion indicates a substantial damage to New Jersey and its citizens and a greater damage than New Jersey should be required to bear and more than New Jersey should be required to yield to other states in the enjoyment of a common stream.

40. Any substantial damage to New Jersey and its citizens can be removed by reducing the volume of the New York diversion and by modifying the plan of releasing water into the river from impounding reservoirs during periods of low flow in the river (thereby increasing the flow in the river during low stages), and by treatment of sewage and industrial waste at Port Jervis.

41. The New York diversion is found to be excessive to the extent that it exceeds the equivalent of 440 million gallons daily. A draft by New York of the equivalent of 440 million gallons daily (with proper release of water during low flows of the river) is as great a draft as New York should be allowed to make.

42. The taking of the equivalent of 440 million gallons daily by New York City with proper releases of water during low flows and with a proper treatment of the sewage and industrial wastes of Port Jervis will not injuriously affect New Jersey.

43. The taking of the equivalent of 440 million gallons daily does not exceed New York's fair share under the doctrine of equitable apportionment.

44. The prayer of the Pennsylvania intervention for the application of the doctrine of equitable apportionment is approved in principle.

45. The prayer of Pennsylvania for a present allotment to Pennsylvania and Philadelphia of the equivalent of 750 million gallons daily from the Pennsylvania tributaries of the Delaware is denied without prejudice, as there is no present or authorized plan of Pennsylvania or Philadel-

phia to take waters from the Pennsylvania tributaries of the Delaware for Philadelphia municipal supply or for the supply of Eastern Pennsylvania. The judicial power of the court under the Constitution extends only to actual cases and controversies and the court is without power to render a declaratory judgment to the effect that, in the event the City of Philadelphia and Eastern Pennsylvania should desire to take waters from the Pennsylvania tributaries of the Delaware, they would be entitled to 750 million gallons daily.

46. The prayer of the Pennsylvania intervention that any allocation of Delaware River water to the State and City of New York shall not constitute a prior appropriation, that is, an appropriation which would give them any superiority of right, is granted.

47. The prayer of the Pennsylvania intervention for the appointment of a river master is denied without prejudice.

48. The plan put forward by Pennsylvania of releasing water from the impounding reservoirs is approved for the present, subject to such modifications as actual tests and experience may indicate, and without prejudice to any party to this case to apply for modification.

49. The carrying out of the New York diversion will not be in violation of the Federal Water Power Act.

50. Any damage which may occur by reason of increasing the salinity of the Delaware Bay and river and thereby increasing the area in which the teredo or shipworm can operate is found to be inconsequential.

51. The modification of the New York plan of diversion, as herein recommended, will leave conditions so that New Jersey will not be unreasonably affected and will occasion only such very slight and inconsequential damage and inconvenience as New Jersey must necessarily bear in the use of a stream in which it has only a common interest with other states.

52. The plan of diversion as herein modified will not operate to take the property of New Jersey and its people

without due process of law in violation of the Fourteenth Amendment of the Constitution, or to regulate commerce among the states in violation of Article 1, Section 8 of the Constitution or to prefer the ports of New York to the ports of New Jersey, in violation of Article I, Section 9 of the Constitution.

53. The prayer of the bill of New Jersey that the State and City of New York be enjoined from diverting *any waters whatever* from the Delaware River or its tributaries into another watershed is denied, but the prayer of the bill is granted to the extent that the proposed diversion exceeds the equivalent of 440 million gallons daily.

54. The denial of an injunction against the taking of not in excess of the equivalent of 440 million gallons daily and the permission to divert that volume of water are also on the following conditions:

(a) Before any diversion is made proper works shall be constructed at Port Jervis for the treatment of the sewage and industrial waste of Port Jervis, as indicated in the recommendations for a decree.

(b) At any time the stage of the Delaware River falls below .50 c. s. m. at Port Jervis or Trenton, or both, there shall be releases of water from the impounding reservoir or reserviors in accordance with the Pennsylvania plan of releasing, subject to such modifications of said Pennsylvania plan as may hereafter be ordered.

(c) Pennsylvania and New Jersey, through accredited representatives, shall at all reasonable times have the right to inspect the dams, reservoirs and other works constructed by the City of New York and to inspect the inflow and outflow and diverted flow of said reservoirs and to inspect the meters and other apparatus installed and to inspect all records pertaining to inflow, outflow and diverted flow.

55. The cause will be retained in court for proper applications relative to matters left open to change or modification and relative to those features as to which there has been a decision without prejudice. Such applications may be made by any party to the cause.

56. As the decision is not in accord with all the contentions of any party to the suit, the costs should be apportioned and the following apportionment is recommended: New Jersey, 35%; New York City, 35%; New York State, 15%; Commonwealth of Pennsylvania, 15%.

XXVI.

RECOMMENDATIONS FOR A DECREE.

I recommend that a decree be entered:

1. Denying the injunction prayed for by New Jersey to the extent that it seeks to restrain the State of New York and City of New York from diverting to the New York City water supply *any water whatever* from the Delaware River or the tributaries of the Delaware River.

2. Denying the injunction prayed for by New Jersey to the extent that it seeks to restrain the State of New York and City of New York from diverting from the Delaware River or its tributaries to the New York City water supply the equivalent of 440 million gallons of water daily.

3. Granting New Jersey an injunction restraining the State of New York and City of New York from diverting from the Delaware River or its tributaries to the New York City water supply, or from the Delaware River watershed to any other watershed, in excess of the equivalent of 440 million gallons of water daily.

4. Providing that the denial of an injunction against diverting the equivalent of 440 million gallons daily be made subject to the following conditions with which New York State and New York City shall comply or shall cause compliance to be made:

(a) Before any diversion shall be made an efficient plant for the treatment of sewage at Port Jervis, New York, shall be constructed and the sewage of Port Jervis entering the Delaware or Neversink Rivers shall be treated to such an extent as to effect a reduction of 85% in the organic impurities. And the effluent from such plant shall be treated with a chemical germicide, or otherwise, so that the B. coli originally present in the sewage shall be reduced by 90%

Untreated industrial waste from plants in said town of Port Jervis shall not be allowed to enter the Delaware or Neversink Rivers, and the treatment of such industrial wastes shall be such as to render the effluent practically free from suspended matter and nonputrescent; and said treatment of sewage and industrial waste shall be maintained so long as any diversion is made from the Delaware River or its tributaries.

(b) At any time the stage of the Delaware River falls below .50 c. s. m. at Port Jervis, New York, or Trenton, New Jersey, or both (.50 c. s. m. being equivalent to a flow of 1535 c. f. s. at Port Jervis and 3400 c. f. s. at Trenton), water shall be released from one or more of the impounding reservoirs of New York City in sufficient volume to restore the flow at Port Jervis and Trenton to .50 c. s. m., provided, however, that there is not required to be released at any time water in excess of 30% of the diversion area yield, and the diversion area yield having been ascertained to be 2.2 c. s. m., the maximum release required shall be 30% of that amount, or .66 cubic feet per second per square mile of the areas from which water is diverted.

In determining the quantity of water to be released so as to add to the flow of the Delaware River, the Neversink River shall be treated as if it flowed into the Delaware River above Port Jervis, and the number of second feet of water released from the impounding

reservoir on the Neversink River shall be added to the number of second feet of water released from other reservoirs, so as to determine whether the quantity of water, required by this decree to be released, has been released.

(c) That the State of New Jersey and the Commonwealth of Pennsylvania, through accredited representatives, shall at all reasonable times have the right to inspect the dams, reserviors and other works constructed by the City of New York and to inspect the diversion areas and the inflow, outflow and diverted flow of said areas, and to inspect the meters and other apparatus installed by the City of New York and to inspect all records pertaining to inflow, outflow and diverted flow.

5. Providing that the diversion herein allowed shall not constitute a prior appropriation and shall not give the State of New York and City of New York any superiority of right over the State of New Jersey and Commonwealth of Pennsylvania in the enjoyment and use of the Delaware River and its tributaries.

6. Providing that the prayer of the intervenor, Commonwealth of Pennsylvania, for the present allocation to it of the equivalent of 750 million gallons of water daily from the Delaware River or its Pennsylvania tributaries be denied without prejudice.

7. Providing that the prayer of the intervenor, Commonwealth of Pennsylvania, for the appointment of a river master be denied without prejudice.

8. Providing that this decree is without prejudice to the United States and particularly is subject to the paramount authority of Congress in respect to navigation and navigable waters of the United States, and subject to the powers of the Secretary of War and Chief of Engineers of the United States Army in respect to navigation and navigable waters of the United States.

9. Providing that this cause shall be retained in court and that appropriate applications for relief may hereafter be made by any party hereto as to any matter determined without prejudice and also for modification of any of the provisions of Section 4 (a, b and c) of this decree.

10. Providing that the diversion herein allowed of the equivalent of 440 million gallons of water daily means that the total quantity diverted in any year divided by the number of days in the year shall not exceed 440, and the same principle shall apply to any less diversion.

11. Providing that the costs of the cause be divided, and allocated against the parties hereto as follows: State of New Jersey, 35%; City of New York, 35%; State of New York, 15%; Commonwealth of Pennsylvania, 15%.

Respectfully submitted,

CHARLES N. BURCH,
Special Master.

XVII.

APPENDIX A.

MONTHLY DISCHARGE OF DELAWARE RIVER AT PORT JERVIS, N. Y.

Month	Discharge in second-feet		
	Maximum	Minimum	Mean
1924–25			
October	73,900	935	7,260
November	11,600	525	1,930
December	6,000	1,720	3,020
January	1,800	1,000	1,300
February	80,000	1,000	12,600
March	13,700	5,220	8,820
April	11,800	4,610	7,160
May	8,380	3,140	4,900
June	3,770	940	1,970
July	13,700	1,240	3,540
August	5,220	940	2,630
September	15,300	740	3,490
The year	80,000	525	4,840
1925–26			
October	12,900	1,470	2,990
November	29,700	3,200	9,230
December	20,000	1,470	6,540
January	15,700	2,000	3,990
February	11,000	2,150	5,130
March	25,700	3,200	9,090
April	38,000	6,100	13,400
May	8,380	1,880	3,730
June	3,440	1,550	2,280
July	2,640	745	1,090
August	9,730	898	3,450
September	4,800	1,000	2,220
The year	38,000	745	5,250
1926–27			
October	13,300	1,550	5,090
November	58,200	3,950	12,000
December	7,580	2,800	3,740
January	17,000	2,200	4,750
February	12,200	3,690	6,480
March	46,800	4,800	17,400
April	7,580	3,080	5,330
May	30,400	3,920	9,240
June	7,980	1,470	3,460
July	5,020	898	1,570
August	16,100	1,550	3,650
September	26,200	1,320	5,650
The year	58,200	898	6,530

APPENDIX A.—*Continued*

Month	Discharge in second-feet		
	Maximum	Minimum	Mean
1927–28			
October	56,900	1,060	12,600
November	43,800	4,500	16,000
December	44,500	3,440	15,200
January	13,500	2,340	5,270
February	21,300	2,440	7,090
March	18,800	2,240	6,900
April	33,200	6,820	13,200
May	27,600	3,690	11,100
June	43,800	4,220	11,900
July	35,500	3,690	10,100
August	16,600	3,560	5,740
September	10,100	2,010	3,740
The year	56,900	1,060	9,900
1928–29			
October	2,330	1,200	1,720
November	1,900	1,020	1,420
December	5,020	1,260	2,430
January	11,300	1,690	3,310
February	12,400	1,700	3,350
March	56,500	5,180	14,800
April	44,500	5,830	17,600
May	18,900	5,500	9,370
June	5,340	1,430	2,580
July	3,600	922	1,660
August	1,980	676	1,110
September	2,110	594	1,140
The year	56,500	594	5,050
1929			
October	9,870	1,110	3,120
November	19,300	2,380	5,180
December	23,200	2,550	6,840
The year	23,200	2,550	5,046

APPENDIX A.

MONTHLY DISCHARGE OF DELAWARE RIVER AT TRENTON, N. J.

Month	Discharge in second-feet			
	Observed			Corrected for diversion
	Maximum	Minimum	Mean	Mean
1924–25				
October	108,000	2,560	15,500	15,900
November	14,400	1,720	3,650	4,050
December	11,000	3,860	6,250	6,470
January	.....	.....	3,390	3,600
February	110,000	.....	27,400	27,600
March	24,700	12,300	17,300	17,500
April	18,900	.....	12,500	12,900
May	.....	7,100	10,000	10,400
June	8,600	2,710	4,670	5,070
July	.....	3,020	5,750	6,150
August	.....	2,300	6,090	6,490
September	17,300	1,990	5,580	5,980
The year	110,000	1,720	9,710	10,000
1925–26				
October	17,300	2,430	4,980	5,410
November	38,700	6,200	15,800	16,200
December	38,700	.....	13,900	14,300
January	23,800	.....	8,620	8,890
February	.....	.....	12,900	13,200
March	34,400	8,100	18,500	19,000
April	46,900	9,750	20,000	20,500
May	14,400	3,520	6,940	7,370
June	8,600	3,520	5,080	5,510
July	3,520	1,810	2,390	2,820
August	12,300	2,300	6,440	6,870
September	15,100	3,180	5,970	6,400
The year	46,900	1,810	10,100	10,500
1926–27				
October	29,700	3,860	10,100	10,500
November	103,000	8,600	25,000	25,400
December	17,300	6,500	9,870	10,100
January	43,300	4,600	1,200	11,500
February	27,400	8,100	15,000	15,200
March	62,300	11,600	27,000	27,400
April	17,300	7,100	11,400	11,800
May	44,500	7,100	15,800	16,300
June	15,800	5,400	9,060	9,490
July	11,000	2,860	5,120	5,550
August	24,700	4,600	8,610	9,040
September	35,400	3,180	10,000	10,400
The year	103,000	2,860	13,200	13,500

APPENDIX A.—*Continued*

Month	Discharge in second-feet			
	Observed			Corrected for diversion
	Maximum	Minimum	Mean	Mean
1927–28				
October	106,000	3,020	24,200	24,600
November	74,800	10,400	27,300	27,700
December	76,200	11,000	28,700	29,100
January	21,300	7,000	12,400	12,600
February	32,400	9,000	17,700	18,000
March	27,400	7,100	13,500	13,900
April	44,500	14,400	24,700	25,100
May	45,700	9,750	19,400	19,800
June	40,900	8,600	19,800	20,200
July	59,700	11,000	23,500	23,900
August	35,400	5,800	13,400	13,800
September	22,100	5,000	9,780	10,200
The year	106,000	3,020	19,500	19,900
1928–29				
October	5,280	3,380	4,290	.....
November	4,570	3,060	3,600	.....
December	8,030	2,900	4,820	.....
January	16,500	3,710	8,030	.....
February	30,400	4,570	8,890	.....
March	81,800	13,600	27,500	.....
April	59,700	11,500	29,800	.....
May	31,400	12,200	18,400	.....
June	12,200	4,220	6,150	.....
July	6,760	2,230	3,740	.....
August	7,900	2,000	2,990	.....
September	6,370	1,780	3,550	.....
The year	81,800	1,780	10,100	.....
1929				
October	21,300	2,480	7,720	.....
November	33,400	5,640	10,900	.....
December	31,400	6,000	12,200	.....
			10,273	

NOTE.—The diversions were: Pennsylvania Canal, 53 second-feet, Apr. 15 to Dec. 15, 1913; Mar. 23-28, Apr. 5 to Dec. 10, 1914; Mar. 8 to Dec. 12, 1915; Mar. 15 to Dec. 20, 1916; Mar. 17 to Dec. 9, 1917; Mar. 16 to Dec. 6, 1918; Mar. 17 to Dec. 5, 1919; Mar. 23 to Dec. 13, 1920; Mar. 2 to Dec. 9, 1921; Mar. 4 to Dec. 3, 1922; Feb. 27 to Dec. 8, 1923; Mar. 7 to Sept. 30, 1924; 50 second-feet, Oct. 1 to Dec. 5, 1924; Mar. 24 to Nov. 28, 1925; Mar. 11 to Nov. 27, 1926; Mar. 28 to Sept. 30, 1927; and 20 second-feet, Oct. 1 to Nov. 19, 1927; Mar. 26 to Sept. 30, 1928.

The Delaware and Raritan Canal feeder, 160 second-feet, from Mar. 1 to Dec. 31 of each year to Sept. 30, 1924; 140 second-feet Oct. 1 to Nov. 30, 1924, Apr. 1 to Sept. 30, 1925; 130 second-feet, Oct. 1 to Dec. 31, 1925; 40 second-feet, Jan. 1-15 1926; 130 second-feet, Mar. 1 to Nov. 30, 1926, Mar. 1 to Dec. 31, 1927, and Mar. 1 to Sept. 30, 1928.

Trenton Power Canal, 210 second-feet daily, Feb. 24, 1913, to Sept. 30, 1924; 250 second-feet, daily, Sept. 30, 1924, to Sept. 30, 1928.

Diversion figures are based on occasional discharge measurements.

APPENDIX B.

EFFECT OF NEW YORK PLAN ON FLOW OF DELAWARE RIVER AT PORT JERVIS AS ESTIMATED BY NEW YORK COMPARED WITH EFFECT ON FLOW OF DELAWARE RIVER AT TRI-STATE ROCK AS ESTIMATED BY NEW JERSEY

Port Jervis affected by diversion from 540 square miles and Tri-State Rock affected by diversion from 610 square miles. (The difference of 70 square miles represents the Neversink Diversion area. The Neversink flows into the Delaware at Tri-State Rock, which is below Port Jervis.)

The effect at Port Jervis is taken from New York Exhibit 331. The effect at Tri-State Rock is taken from New Jersey Exhibit 74. The average observed flow at Port Jervis is taken from New York Exhibit 331 and is in substantial accord with New Jersey Exhibit 15.

All figures in cubic feet per second.

1925.	Average Observed Flow Port J.	Average Modified Flow Port J.	Average Increase + or Decrease − Port J.	Average Increase + or Decrease − Tri-State R.
January	1,303	1,178	−125	−93
February	12,639	10,254	−2,385	−2,591
March	8,825	7,166	−1,659	−1,903
April	7,156	5,530	−1,626	−1,639
May	4,904	3,873	−1,031	−1,088
June	1,970	1,697	−273	−228
July	3,544	3,310	−234	−221
August	2,628	2,502	−126	−120
September	3,486	2,976	−510	−530
October	2,988	2,647	−341	−404
November	6,231	9,905	−2,326	−2,516
December	6,543	5,159	−1,384	−1,434
1926				
January	3,989	3,312	−677	−748
February	5,134	4,360	−774	−843
March	9,087	7,682	−1,405	−1,397
April	13,430	10,165	−3,265	−3,586
May	3,726	2,788	−938	−967
June	2,277	1,820	−457	−470
July	1,086	1,148	+62	+58
August	3,448	3,162	−286	−403
September	2,221	2,190	−31	−43
October	5,087	4,308	−779	−870
November	11,981	9,402	−2,579	−2,722
December	3,741	3,097	−644	−686
1927				
January	4,751	3,893	−858	−1,009
February	6,485	5,472	−1,013	−1,032
March	17,417	13,943	−3,474	−3,698
April	5,327	4,250	−1,077	−1,265
May	9,240	7,588	−1,652	−1,879
June	3,461	2,764	−697	−807
July	1,572	1,586	+14	−48
August	3,652	3,158	−494	−766
September	5,651	4,845	−806	−864
October	12,555	10,272	−2,283	−2,437
November	15,951	12,874	−3,077	−3,287
December	15,239	12,132	−3,107	−3,222

APPENDIX B.—*Continued*

1928	Average Observed Flow Port J.	Average Modified Flow Port J.	Average Increase + or Decrease − Port J.	Average Increase + or Decrease − Tri-State R.
January	5,273	4,231	−1,042	−1,110
February	7,092	5,892	−1,200	−1,209
March	6,895	5,695	−1,200	−1,335
April	13,182	10,730	−2,452	−2,857
May	11,101	8,731	−2,370	−2,491
June	11,878	9,732	−2,146	−2,670
July	10,110	8,402	−1,708	−1,433
August	5,735	5,088	−647	−750
September	3,740	3,401	−339	−371
October	1,722	1,765	+43	+56
November	1,418	1,400	−18	−28
December	2,427	1,908	−519	−580
1929				
January	3,312	2,602	−710	−792
February	3,353	2,714	−639	−741
March	14,831	11,511	−3,320	−3,365
April	17,619	13,410	−4,209	−4,340
May	9,370	7,370	−2,000	−2,133
June	2,583	2,079	−504	−539
July	1,658	1,637	−21	+19
August	1,114	1,220	+106	+129
September	1,143	1,184	+41	+71

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DELAWARE RIVER DIVERSION CASE

IN THE

Supreme Court of the United States

OCTOBER TERM, 1930.

No. Original 12 9876 5

STATE OF NEW JERSEY,

Plaintiff,

vs.

STATE OF NEW YORK and CITY OF NEW YORK,

Defendants.

COMMONWEALTH OF PENNSYLVANIA,

Intervener.

Plaintiff's Exceptions to the Report of the Special Master.

WILLIAM A. STEVENS,
Attorney-General.

DUANE E. MINARD,
Assistant Attorney-General,
Solicitors of Plaintiff.

March 16, 1931.

JAMES M. BECK,
GEORGE S. HOBART,
Special Counsel.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1930.

No. 16, Original.

STATE OF NEW JERSEY,
Plaintiff,

vs.

STATE OF NEW YORK and CITY OF NEW YORK,
Defendants.

COMMONWEALTH OF PENNSYLVANIA,
Intervener.

PLAINTIFF'S EXCEPTIONS TO THE REPORT OF THE SPECIAL MASTER.

Plaintiff hereby excepts to the findings of fact and to the conclusions of law made and filed by the Special Master on February 2, 1931, to his failure or refusal to make and file findings of fact and conclusions of law as requested by the plaintiff, and to his recommendations for a decree, in the following particulars:

I.

Riparian rights under common law.

Plaintiff excepts to the following conclusions of law in the Report of the Special Master and each of them, respectively, set forth,

Under Part V:

1. (pp. 37 and 38.)

"* * * * I am of the opinion that the principles decided by this court * * * sustain the view that New York City is entitled to divert a reasonable quantity of water from the tributaries of the Delaware * * *. I am brought to the conclusion that the only decision, consonant with right and justice, is to hold that a reasonable diversion by New York City should not be enjoined and that the doctrine of equitable apportionment of the waters of an interstate stream is a sound principle of interstate common law."

2. (p. 39.)

"While these compacts, as they were not ratified by New Jersey, do not at all estop New Jersey from maintaining this suit, yet they are admissible in evidence for the purpose of showing the history of this whole matter and for the purpose of showing that New York has not formulated an arbitrary plan of diversion, entirely of it own making, but on the contrary has adopted a plan unanimously agreed to and approved by the commissioners of the three states, though ratified by the Legislature of New York only."

Under Part XXV:

3. (par. 7, p. 200.)

"In suits between states (heretofore decided by this court) relative to the diversion of waters, there has been built up a system of law denominated as 'interstate common law,' and under principles of interstate common law, the rule of fair and equitable apportionment is to be applied under the facts of this case rather than the common law rule of riparian rights."

4. (par. 53, p. 208.)

"The prayer of the bill of New Jersey that the State and City of New York be enjoined from diverting *any waters whatever* from the Delaware

River or its tributaries into another watershed is denied."

WHEREAS: The Special Master should have made and filed conclusions of law in accordance with the following Requests, and each of them, respectively, as set forth in "Plaintiff's Proposed Findings of Fact and Conclusions of Law":

Under Part V:

5. (par. 2, p. 10.)

"The proposed use of the water by the defendant city is not a common law use, and is, therefore, unlawful unless the rights of lower riparian owners are first acquired by agreement or by the exercise of the power of eminent domain."

6. (par. 6, p. 11.)

"Plaintiff is entitled, under said common law rule to insist that the waters of the Delaware River and its tributaries flow down to it without diminution or alteration in quantity or quality."

Under Part XXIV:

7. (par. 6, p. 59.)

"The great weight of authority in the three states in question supports the exercise by a court of equity of a writ of injunction to enjoin a threatened diversion of waters from their natural course."

8. (par. 7, p. 59.)

"Plaintiff is entitled to injunctive relief as prayed in the complaint."

Plaintiff excepts to the following recommendation of the Special Master for a Decree set forth under Part XXVI of his Report:

9. (par. 1, p. 209.)

"Denying the injunction prayed for by New Jersey to the extent that it seeks to restrain the State of New York and City of New York from

diverting to the New York City water supply *any water whatever* from the Delaware River or the tributaries of the Delaware River."

Reasons.

The reasons for the foregoing exceptions are:

(a) Under the common law relating to riparian rights, in effect in all three States, an injunction to prevent the invasion of the legal rights of plaintiff and its citizens should be granted;

(b) The evidence shows that the proposed diversion will cause substantial damage to the plaintiff and its citizens;

(c) The evidence shows that defendant city has suitable sources of adequate water supply available within its natural watershed which can be used without injury to plaintiff and its citizens.

II.

Necessity for the Diversion.

Plaintiff excepts to the following findings of fact and conclusions of law in the Report of the Special Master, and each of them, respectively, set forth,

Under Part VI:

10. (pp. 52 and 53 Law.)

"The whole question is, have the State of New York and the City of New York the right to make use of the tributaries of the Delaware River as a source of water supply for the City of New York? My conclusion is that they are not precluded from so doing merely for the reason that there are other sources of supply in the State of New York, the taking from which would not affect other states."

Under Part XXV:

11. (par. 18, p. 202 Law.)

> "New York City, acting under the authority of New York State, should have the right to select its source of additional water supply. This is a matter which concerns the administration of its own internal affairs and should not be controlled by another state unless its plan for additional water supply is willful or arbitrary and without sound basis and unreasonably injures such other state."

12. (par. 21, p. 202 Fact.)

> "The selection of the tributaries of the Delaware is not an arbitrary one and without sound reason, as the tributaries of the Delaware furnish the best and purest water available and the supply of water from that source is furnished by gravity, thereby avoiding the expense of pumping and the risk of breakdown in pumping operations, and is the least expensive, though the matter of expense is not as controlling with the Special Master as the other considerations."

Whereas: The Special Master should have made and filed findings of fact and conclusions of law in accordance with the following requests, and each of them, respectively, as set forth in "Plaintiff's Proposed Findings of Fact and Conclusions of Law":

Under Part X:

13. (par. 3, p. 56 Fact.)

> "Official reports of the defendant city, and testimony offered on behalf of the plaintiff, show suitable and adequate supplies within the State of New York, which involve no interstate effect, from four other sources having a safe yield, including the saving from meterage, aggregating over three thousand million gallons per day, or enough to provide future supplies for the city, at the rate of 31 m.g.d. annual increase, for a period of more than a hundred years."

14. (par. 5, p. 56 Fact.)

"Estimates made and confirmed by competent engineers, based upon actual surveys and detailed estimates of quantities and prices of materials and labor, show a comparison of costs per million gallons, both on the basis of original cost and on the basis of costs at the end of 50 or 100 years, favorable to some of the alternative supplies, and with respect to others, not materially in excess of the cost claimed for the Delaware project by the defendant city."

15. (par. 1, p. 57 Law.)

"The alternative sources of supply suggested by the plaintiff are all within the complete control of the defendant state, and if for any reason the quality of the water is unsuitable in its natural state for domestic water supply, there is ample power under its laws to remove the cause of such unsuitable condition."

16. (par. 5, p. 57 Law.)

"There appears to be no public necessity in this case which would justify the defendant city in neglecting the alternative sources of supply in favor of that from the Delaware tributaries, the taking of which will invade the legal rights of the plaintiff and its citizens."

17. (par. 1, p. 58 Law.)

"The balance of equity is with the plaintiff because the proof shows that the plaintiff and its citizens will suffer substantial damages, and there is no necessity for the diversion."

Reqsons.

The reasons for the foregoing exceptions are:

(a) As a matter of law the claim of necessity is immaterial.

(b) The evidence shows that there is no necessity for the proposed diversion.

(c) Mere convenience does not justify diversion from a foreign watershed in which other states have natural rights which would be substantially damaged thereby.

III.

Navigation.

Plaintiff excepts to the following findings of fact and conclusions of law in the Report of the Special Master and each of them, respectively, set forth,

Under Part IX:

18. (p. 94 Law.)

> "I am, therefore, of the opinion that there is no basis for injunctive relief on the part of New Jersey on the ground that the carrying out of the New York plan would obstruct navigation or impair the navigable capacity of the Delaware River."

19. (p. 95 Fact.)

> "The extent of my finding is that *on the proof in this record* there will be no unreasonable obstruction or interference with navigation or the navigable capacity of the Delaware River by reason of the execution of the plan of the City of New York."

Whereas: The Special Master should have made and filed findings of fact and conclusions of law in accordance with the following requests, and each of them, respectively, as set forth in "Plaintiff's Proposed Findings of Fact and Conclusions of Law":

Under Part II:

20. par. 6, p. 5 Fact.)

> "The proposed diversion will reduce the water level in both the tidal and non-tidal sections of the river at all stages of flow."

21. (par. 9, p. 5 Fact.)

"The proposed dams and the proposed diversion of water will create obstructions to the navigable capacity of waters of the United States, to wit, Delaware River and the tributaries in question."

22. (par. 2, p. 6 Law.)

"Whether the effect of the proposed diversion will be injurious to navigation or impair the navigable capacity of the river is a question within the sole jurisdiction of Congress and the Secretary of War to determine, according to the procedure customary in such cases."

Under Part XIII:

23. (par. 9, p. 30 Fact.)

"The proposed diversion of waters will cause substantial and irreparable damage to the property and property rights of plaintiff and its citizens, in respect to the natural and artificial navigation on the Delaware River, which by the acts of the legislatures of all three states has been declared to be, and in fact for a century and a half was, a highway of inter-colonial and interstate commerce."

Reasons.

The reasons for the foregoing exceptions are:

(a) The proposed diversion will substantially affect the navigation in, and the navigable capacity of, the Delaware River and of the tributaries in question.

(b) The defendant city has not complied with the conditions precedent prescribed by the "River and Harbor Act," approved March 3, 1899 (Sections 401 and 403 of Title 33, U. S. Code).

IV.

Water Power.

Plaintiff excepts to the following findings of fact and conclusions of law in the Report of the Special Master, and each of them, respectively, set forth,

Under Part X:

24. (p. 104 Law.)

> "I am of the opinion, therefore, that on the showing made in this case there is no basis for injunctive relief on the ground that the proposed diversion of the City of New York would interfere with development by New Jersey or her citizens of water power on the Delaware River. I do not exclude from the record in the case the evidence of New Jersey as to the possible development of water power, though I find this might properly be done; I am content merely to hold that the showing made by New Jersey in this regard does not form any basis for injunctive relief."

25. (p. 105 Fact.)

> "Weighing all of the mass of evidence, I am not convinced (even conceding the consent of the United States, New York, New Jersey and Pennsylvania could be obtained), that the development of water power in the Delaware River and its tributaries as proposed in Plaintiff's Exhibits 104 and 105, though capable of being constructed from an engineering standpoint, would be financially remunerative."

Under Part XXV:

26. (par. 31, p. 204 Fact.)

> "* * * New Jersey has failed to establish by a preponderance of the convincing evidence that the proposed development of water power is sound economically or attractive financially."

Whereas: The Special Master should have made and filed findings of fact in accordance with the following

Requests, and each of them, respectively, as set forth in "Plaintiff's Proposed Findings of Fact and Conclusions of Law":

Under Part XII:

27. (par. 5, p. 25 Fact.)

"The weight of the evidence shows that the proposed diversion by the defendant city alone will materially reduce the volume of water available for waterpower development, and would increase the cost of development of that power from $132. per horse power before diversion to $144. per horse power after diversion. It also appears that the proposed diversion would reduce the net income from the section of the river adjacent to Pennsylvania and New Jersey from $8,800,000 per year, or 13%, before diversion, to $6,200,000 per year, or 11.8%, after diversion. The difference of $2,600,000 in the annual earning power of the river between Pennylvania and New Jersey as a result of New York's proposed diversion indicates the value of water power rights to riparian owners on the river which would be destroyed by the proposed diversion."

28. (par. 6, p. 26 Fact.)

"It appears from the testimony and exhibits, including Colonel Boggs' report of 1922 (Exhibit 139) that the development of water power on the Delaware River can be carried out in such a way as to provide locks in the dams for slack water navigation capable of carrying vessels of 2,000 tons burden as far as Martin's Creek on the Delaware River, and as far as some point above Bethlehem in the vicinity of the anthracite coal region on the Lehigh River, and that if the two projects are developed together the power project will carry $16,000,000, of the $28,000,000 which the navigation project would cost if carried out alone, thereby reducing the cost of the navigation project to $12,000,000."

29. (par. 9, p. 27 Fact.)

"Plaintiff and its citizens, particularly in the character of riparian proprietors along the Delaware River, and generally as citizens of the communities depending upon the Delaware River for their industrial and commercial welfare, will suffer substantial and irreparable injury to the potential power development along the river by reason of the proposed diversion of waters by the city of New York."

Reasons.

The reasons for the foregoing exceptions are:

(a) Water power rights are important elements of value in riparian lands.

(b) The evidence shows that the deprivation of, or interference with, the rights resulting from the proposed diversion will cause substantial damage to the plaintiff and its citizens.

(c) The mere fact that such water rights have not been fully developed does not affect the right of riparian owners to the use of the water for such purpose.

(d) The water power which is latent in the Delaware River is one of the natural resources necessary to the future economic development of the territory of the plaintiff.

V.

Industrial Uses.

Plaintiff excepts to the following findings of fact in the Report of the Special Master, and each of them, respectively, set forth,

Under Part XIII:

30. (p. 138 Fact.)

> "* * * I am of the opinion that the State of New Jersey has failed to establish by the probative weight of the evidence that the effect of the New York diversion will be to make the waters of the Delaware substantially or materially worse for industrial purposes, * * * On the whole, I am of the opinion, and so find, that the effect of the New York diversion will be to impair but slightly the use of the Delaware River water for industrial purposes; I further find that salinity conditions at any point on the Delaware River in the tidal section where the water is used for industrial purposes will also be adversely affected to only a slight degree."

31. (p. 138 Fact.)

> "I am further of the opinion, and so find, that by decreasing the quantity of the New York diversion and by increasing the quantity of water released during low flows, and by the treatment of sewage and industrial waste at Port Jervis, as hereinafter recommended, any damage to New Jersey or its citizens, in the use of Delaware River water for industrial purposes, will be inconsequential."

Whereas: The Special Master should have made and filed findings of fact in accordance with the following Requests, and each of them, respectively, as set forth in "Plaintiff's Proposed Findings of Fact and Conclusions of Law":

Under Part XV:

32. (par. 2, p. 34 Fact.)

"It appears from the evidence that processes necessary to overcome this increased hardness, computed on the basis of the existing use of the water for industrial purposes within the territorial limits of the plaintiff, will cost $769,000 annually and represent a capitalized overhead cost of at least $12,000,000 to be carried in perpetuity by those industries."

33. (par. 3, p. 34 Fact.)

"It appears that the same additional annual expense and capitalized overhead cost will confront all future industrial development along the river and will exercise its influence upon the selection of that location by future prospective industries dependent upon the use of large quantities of water for industrial or process purposes."

34. (par. 10, p. 36 Fact.)

"The plaintiff and its citizens will suffer substantial and irreparable injury to present and future industrial development within the territorial limits of the plaintiff by reason of the proposed diversion by the defendant city."

Reasons.

The reasons for the foregoing exceptions are:

(a). The evidence shows that the proposed diversion will cause a substantial increase in the hardness of the water of the river within the territory of the plaintiff, and that there will be substantial damage to the plaintiff and its citizens because of the increased cost of industrial operations by reason thereof.

(b) The evidence shows that the proposed diversion will impair the present and future industrial development of plaintiff's territory, and depreciate the value of lands owned by plaintiff and its citizens.

VI.

Equitable Regulation.

Plaintiff excepts to the following finding of fact in the Report of the Special Master set forth,

Under Part XXIV:

35. (p. 197 Fact.)

Wherein, respecting the suggestion that New York City be required to fully develop storage up to approximately two cubic feet per second per square mile of watershed, one-half of which could be used for municipal supply and the other half for increasing and maintaining a regulated flow in the river down stream in order to impair as little as possible conditions resulting from the proposed diversion, he concluded

> "This plan of Prof. Barrows came into the case at a late stage and on the hearing of the rebuttal evidence. It seems to me that this plan imposes an unnecessarily heavy burden."

Whereas: The Special Master should have made and filed findings of fact and conclusions of law in accordance with the following Requests, and each of them, respectively, as set forth in "Plaintiff's Proposed Findings of Fact and Conclusions of Law":

Under Part XXV:

36. (par. 2, p. 60 Fact.)

> "It appears that it is entirely practicable and feasible, and highly desirable from the standpoint of every use of the river, to provide a regulated flow of 1 c.s.m., by impounding larger quantities of water during high flow periods to be released during the low flow periods."

37. (par. 3, p. 60 Fact.)

> "It appears that the average flow in the Delaware River is approximately 2 c. s. m. and that by the

use of reservoirs at Cannonsville and East Branch, suggested by plaintiff's witnesses, a regulated flow, of, or at the rate of, 1,715 c. f. s. could be provided for every calendar day of each year; that the proposed water supply for the defendant city of 600 m. g. d. could be provided either from one or both of the reservoirs proposed by plaintiff's witnesses at less than the estimated cost of the reservoirs proposed by defendant city and still leave a daily regulated flow of about 1 c. s. m. for the river. In addition thereto there would be provided a reserve storage of 31,000,000,000 cubic feet, or 225,000,000,000 gallons for other purposes where temporary increases in the flow of the river is desired."

38. (par. 1, p. 61 Law.)

"If defendant city has a right to divert water from the tributaries of said river, in conflict with rights of the plaintiff and its citizens, equity requires that such conflict of rights shall be regulated, as the case of conflicting easements, in a manner that will cause the least damage to or destruction of the rights of plaintiff and its citizens. That course requires the adoption of a plan such as is proposed by the plaintiff's witnesses for the construction of sufficient dams and the impounding of sufficient waters to provide a division of waters as nearly equal as possible between the defendant city and the plaintiff and its citizens."

Reasons.

The reasons for the foregoing exceptions are:

(a) The evidence shows that the proposed plan of equitable regulation will minimize as much as possible the damage to plaintiff and its citizens resulting from any diversion of water by defendant city from the Delaware watershed.

(b) If plaintiff is not entitled to an injunction as prayed, any diversion which is permitted should be made in a manner that would cause the least damage to the plaintiff and its citizens.

VII.

The Master's Plan.

Plaintiff excepts to the following findings of fact and conclusions of law in the report of the Special Master, and each of them, respectively, set forth,

Under Part XXV:

39. (par. 40, p. 206 Fact.)

> "Any substantial damage to New Jersey and its citizens can be removed by reducing the volume of the New York diversion and by modifying the plan of releasing water into the river from impounding reservoirs during periods of low flow in the river (thereby increasing the flow in the river during low stages), and by treatment of sewage and industrial waste at Port Jervis."

40. (par. 42, p. 206 Fact.)

> "The taking of the equivalent of 440 million gallons daily by New York City with proper releases of water during low flows and with a proper treatment of the sewage and industrial wastes at Port Jervis will not injuriously affect New Jersey."

41. (par. 51, p. 207 Fact.)

> "The modification of the New York plan of diversion, as herein recommended, will leave conditions so that New Jersey will not be unreasonably affected and will occasion only such very slight and inconsequential damage and inconvenience as New Jersey must necessarily bear in the use of a stream in which it has only a common interest with other states."

Plaintiff excepts to the following recommendations of the Special Master for a Decree as set forth under Part XXIV of his Report.

42. (par. 2, p. 209.)

> "Denying the injunction prayed for by New Jersey to the extent that it seeks to restrain the

State of New York and City of New York from diverting from the Delaware River or its tributaries to the New York City water supply the equivalent of 440 million gallons of water daily."

Reasons.

The reasons for the foregoing exceptions are:

(a) The question whether any substantial damage to plaintiff and its citizens can be removed by the Special Master's plan is not within the issues raised by the pleadings.

(b) There is no evidence that the modification of the New York plan of diversion, as recommended by the Special Master, will not cause substantial damage to the plaintiff and its citizens.

Respectfully submitted,

WILLIAM A. STEVENS,
Attorney General,

DUANE E. MINARD,
Assistant Attorney General,
Solicitors of Plaintiff.

March 16, 1931.

JAMES M. BECK,
GEORGE S. HOBART,
Special Counsel.

FILE COPY

MAR 14 1931

IN THE

Supreme Court of the United States

OCTOBER TERM, 1930.

ORIGINAL. No. [redacted] 5

STATE OF NEW JERSEY,

Plaintiff,

against

STATE OF NEW YORK and THE CITY OF NEW YORK,

Defendants,

and

COMMONWEALTH OF PENNSYLVANIA,

Intervenor.

EXCEPTIONS OF THE DEFENDANT, THE STATE OF NEW YORK, TO THE REPORT OF THE SPECIAL MASTER.

JOHN J. BENNETT, JR.,
Attorney General of the State of New York,
Solicitor for the Defendant, State of New York.

THOMAS PENNEY, JR.,
Special Assistant Attorney General,
Of Counsel.

ALBANY TIMES-UNION PRINTING
ALBANY, N. Y.

IN THE

Supreme Court of the United States

STATE OF NEW JERSEY, Plaintiff, *against* STATE OF NEW YORK and THE CITY OF NEW YORK, Defendants, *and* COMMONWEALTH OF PENNSYLVANIA, Intervenor.	OCTOBER TERM, 1930. ORIGINAL No. 16.

EXCEPTIONS OF THE DEFENDANT, THE STATE OF NEW YORK, TO THE REPORT OF THE SPECIAL MASTER.

The State of New York, one of the defendants in the above entitled original suit, hereby excepts to certain of the findings of fact and conclusions of law, and recommendations for a decree set forth in the report of the Honorable Charles N. Burch, Special Master herein, duly made and filed, in the following particulars, to wit:

A.

In so far as the Report of the Special Master contains findings, conclusions and recommendations that the defendants should be enjoined from diverting more water than at the rate of 440 million gallons a day.

FIRST: To that part of the General Conclusion at the foot of page 193 of the Report, which reads:

"Weighing and appreciating the evidence as a whole, I reach the conclusion and so find that the proposed draft of New York City of the equivalent of 600 million gallons daily is excessive and that this draft should be reduced * * *."

SECOND: To that part of the General Conclusion appearing at the center of page 195 of the Report as follows:

"I think the third stage should be enjoined."

THIRD: To the Summary of Finding of Fact and Conclusion of Law, numbered 41 on page 206 of the Report which reads as follows:

"The New York diversion is found to be excessive to the extent that it exceeds the equivalent of 440 million gallons daily. A draft by New York of the equivalent of 440 million gallons daily (with proper release of water during low flows of the river) is as great a draft as New York should be allowed to make."

FOURTH: To the Summary of Finding of Fact and Conclusion of Law, numbered 53 on page 208 of the Report which reads as follows:

"The prayer of the bill of New Jersey that the State and City of New York be enjoined from diverting *any water whatever* from the Delaware River or its tributaries into another watershed is denied, but the prayer of the bill is granted to the extent that the proposed diversion exceeds the equivalent of 440 million gallons daily."

FIFTH: To the Recommendation for a Decree, numbered 3 on page 209 of the Report as follows:

"Granting New Jersey an injunction restraining the State of New York and City of New York from diverting from the Delaware River or its tributaries to the New York City water supply, or from the Delaware River watershed to any other watershed, in excess of the equivalent of 440 million gallons of water daily."

and to the "opinion" appearing on page 199 of the Report reading as follows:

"I may add that I am of the opinion that New York State as well as the City of New York, should be bound by the terms of the decree in this cause."

The grounds for the foregoing exceptions, numbered First through Fifth, are (a) that a decree, in accordance with the findings, conclusions and recommendations there excepted to, would forever forbid both defendants from diverting more water, no matter what their necessities might be in the future; (b) because the question of the present or future need of any of the other municipalities of New York State for these or other headwaters of the Delaware River was not raised by the pleadings, nor necessary to the determination of the issues therein, nor litigated by any evidence or argument herein, a decree herein forever closing that question is therefore not proper; and (c) because they are based upon findings and conclusions that the proposed diversion would cause damage to complainant of sufficient magnitude to warrant an injunction, whereas, findings that such damage would result are in some instances contrary to the weight of the evidence, and in other instances they are not supported by competent evidence. Exceptions to findings and conclusions on damage follow.

B.

In so far as the Report of the Special Master contains findings and conclusions that the proposed diversion would cause damage that entitles plaintiff to an injunction.

SIXTH: To that part of the General Conclusion on page 193 which reads:

> "I have found that the execution of the New York project would cause slight damage to navigation, agriculture, municipal water supply, shad fisheries and industrial uses of the Delaware River, and would cause more than slight damage to the recreational uses of the river and to the oyster industry. However, adding all of these elements of damage together gives a total of substantial damage and, in my opinion, more than New Jersey should be expected to bear under the principle of fair and equitable apportionment."

in so far as it finds as much as even slight damage in any of the above respects and in that it establishes a principle that slight or inconsequential damages to diverse interests may be added together to make a total of a substantial damage.

SEVENTH: To Summary Finding or Conclusion numbered 27 on page 203 in so far as it finds even a slight adverse effect on navigation and navigable capacity because it is not supported by the weight of the evidence.

And for the same reason to the implication at the top of page 95 of the Report that although there will be no unreasonable obstruction or interference with navigation or the navigable capacity there will be some obstruction or interference thereto.

EIGHTH: To Summary Finding or Conclusion numbered 35 on page 205 of the Report in so far as it finds even slight or immaterial damage to agricultural lands because it is not supported by the weight of the evidence.

And for the same reason to the paragraph at the top of page 151 of the Report which reads:

> "On the whole I am quite content in the conclusion and finding that the carrying out of the New York plan will have a very slight adverse effect on agriculture, and I think that such slight adverse effect will be very largely, if not entirely, overcome by the modification of the New York plan as set out in this report."

NINTH: To Summary Finding or Conclusion numbered 33 on page 205 of the Report which reads:

> "The Delaware River is the source of water supply of Trenton, New Jersey, and other New Jersey municipalities. The New York diversion will not materially affect the Delaware as a source of municipal water supply. The effect will be slight and immaterial."

in so far as it finds that there will be any adverse effect upon the river as a source of municipal water supply because such a finding is not based upon the weight of the evidence.

And for the same reason to that part of the Report at the top of page 128 thereof which reads:

> "I find that said diversion will adversely affect to a very small degree, but not substantially, Delaware River waters as a source of municipal water supply."

TENTH: To Summary Finding or Conclusion, numbered 36 on page 205, in so far as it finds that there would be even

slight or immaterial damage to the shad industry, for the reason that there was no evidence to support such a finding,—and to the finding to the same effect at the last line on page 158 of the Report.

ELEVENTH: To Summary Finding or Conclusion, numbered 34 on page 205, that:

> "The effect of the New York diversion on the waters of the Delaware River for industrial uses will be slight and immaterial."

in so far as it finds that there will be even slight or immaterial effect that would be adverse to plaintiff,—and to the findings on page 138 of the Report in so far as they are to the effect that there would be "some impairment" or some slight adverse effect upon the water for industrial purpose;

Because (a) such findings are contrary to the weight of the evidence; (b) they, and their inclusion in a total of other damages to make a substantial damage, are inconsistent with the finding (on page 138) that the effect on the water for industrial purposes "will be inconsequential."

TWELFTH: To Finding or Conclusion, numbered 38 on page 205 of the Report, which reads:

> "The effect of diversion on the oyster industry in Delaware Bay will be to increase very slightly the salinity of waters over the oyster grounds and to cause somewhat more than slight damage to the oyster industry. The value and extent of this industry are large."

—and to the finding to the same effect at the center of page 176 of the Report;

Because they are contrary to the weight of the evidence.

THIRTEENTH: To Finding or Conclusion, numbered 37 on page 205 of the Report, which reads:

> "The effect of the New York diversion on the recreational uses of the river will be to cause somewhat more than slight damage, particularly as affecting the reputation of the river as a place of recreational resort. The investment in recreational camps, hotels and other facilities is large."

—and to the findings and conclusions on page 146 of the Report that the reputation or the use of the river for recreational purposes would be appreciably impaired;

Because they are contrary to the weight of competent evidence.

FOURTEENTH: To Finding or Conclusion, numbered 32 on page 205 of the Report in so far as it finds that there would be even slight adverse effect upon the sanitary condition of the river.

—and to the finding and opinion on page 125 to the same effect;

Because they are contrary to weight of the competent evidence.

FIFTEENTH: To so much of Summary Finding or Conclusion, numbered 51 on page 207 of the Report as finds that even such a modified diversion as the Special Master would permit, would occasion even slight damage to any interest of the plaintiff.

SIXTEENTH: To the Summary Finding or Conclusion, numbered 39 on page 206 of the Report, reading as follows:

> "TOTALING all the effects of the New York diversion indicates a substantial damage to New Jersey and its citizens and a greater damage than New Jersey should be required to bear and more than New Jersey should

be required to yield to other states in the enjoyment of a common stream."

—and to the similar finding on page 193 included above in Exception "SIXTH";

Because (a) none of the separate items of damage, whether termed "slight," "inconsequential," "immaterial," "more than slight," or otherwise, is alone sufficient to constitute the *quantum* of damage which this Court has said must be established before it will grant injunctive relief in a suit of this kind, (b) and these separate items of "slight" or similar damage are not based on competent evidence or the weight thereof, (c) and even if they were so found, none was sufficient to be of any appreciable note in an addition of all such items, (d) and the principle of adding together items of a different nature is mathematically, legally, and equitably erroneous.

C.

In so far as the Report of the Special Master finds, concludes, and recommends that the decree should not be final but should be subject to modification.

SEVENTEENTH: To Recommendation numbered 9 on page 212 of the Report which reads:

"Providing that this cause shall be retained in Court and that appropriate applications for relief may hereafter be made by any party hereto as to any matter determined without prejudice and also for modification of any of the provisions of Section 4 (a, b and c) of this decree."

—and to Finding or Conclusion, numbered 55, on page 209 to the same effect.

—and to the first paragraph on page 195 (part of the "General Conclusion") to the same effect.

—and to the paragraph starting at the foot of page 198 (part of the "General Conclusion") to the same effect;

Because the damage, if any, is so trivial and the engineering predictions are so reliable, and the necessity of defendants for water is relatively so outstanding, and the public interest in an end whenever practicable to litigation is such that a final decree rather than one subject to modification, is preferable.

D.

Alternative Recommendations for a Decree.

This defendant, to carry into effect the exceptions hereinabove taken, requests this Court to enter a decree

Dismissing the complaint

or

Dismissing plaintiff's bill of complaint without prejudice to her right to maintain a suit against either or both defendants whenever it shall appear that substantial interests of the plaintiff are being injured through a material increase of the amount of the headwaters or other waters of the Delaware River diverted, over and above a diversion at the rate of 440 million gallons a day in accordance with the first two stages of the plan for impounding, release, and diversion here sought to be enjoined.

Respectfully submitted,

JOHN J. BENNETT, JR.,
Attorney General of the
State of New York,
Solicitor for the Defendant,
the State of New York.

THOMAS PENNEY, JR.,
Special Assistant Attorney General,
Of Counsel.

FILE COPY

MAR 13 1931

CHARLES ELMORE CROPLEY
CLERK

IN THE

Supreme Court of The United States

OCTOBER TERM, 1930

No. [redacted] 5

STATE OF NEW JERSEY,
Plaintiff,

against

STATE OF NEW YORK and THE CITY OF NEW YORK,
Defendants,

COMMONWEALTH OF PENNSYLVANIA,
Intervenor.

Exceptions of the Defendant, The City of New York, to the Report of the Special Master and his Recommendations for a Decree.

ARTHUR J. W. HILLY,
Corporation Counsel,
Solicitor for the Defendant,
The City of New York.

J. JOSEPH LILLY,
FRANK H. DEAL,
FRANK J. COYLE,
DAVID C. BRODERICK,
of Counsel.

(22036)

IN THE

Supreme Court of The United States

October Term, 1930

No. 16, Original

STATE OF NEW JERSEY,
Plaintiff,

against

STATE OF NEW YORK and the CITY OF NEW YORK,
Defendants,

COMMONWEALTH OF PENNSYLVANIA,
Intervenor.

Exceptions of the defendant, The City of New York, to the report of the Special Master and his recommendations for a decree.

Now comes The City of New York, one of the defendants in the above-entitled suit and objects and excepts to the report of Hon. Charles N. Burch, Special Master herein, filed in the office of the Clerk of this Court, on or about the 25th day of February, 1931, in the following particulars, to wit:

A. THAT THE DIVERSION OF THE EQUIVALENT OF 600 MILLION GALLONS PER DAY, WITH THE NEW YORK PLAN OF RELEASE, IS EXCESSIVE AND SHOULD BE ENJOINED IN EXCESS OF A DIVERSION OF THE EQUIVALENT OF 440 MILLION GALLONS A DAY, WITH THE PENNSYLVANIA PLAN OF RELEASE, AND THE INSTALLATION OF A SEWAGE DISPOSAL PLANT AT PORT JERVIS.

1. To the conclusion of law or finding of fact numbered 41 (Report of Special Master, p. 206) in its entirety.

2. To the findings of fact or conclusions of law (Report of Special Master, p. 193) that the proposed draft of the defendant, The City of New York, is excessive and should be reduced.

3. To so much of the conclusion of law or finding of fact numbered 53 (Report of Special Master, p. 208) as concludes or finds that the prayer (Bill of Complaint, p. 27) of the Bill of Complaint herein should be granted to the extent that the proposed diversion exceeds the equivalent of 440 million gallons daily.

4. To the finding of fact or conclusion of law (Report of Special Master, p. 146) that the plan of release (Exhibit 4 at its p. 15) of this defendant is defective in that releasing of water is based on conditions in the diversion area.

5. To the finding of fact or conclusion of law numbered 37 (Report of Special Master, pp. 205, 146) in its entirety.

6. To the finding of fact or conclusion of law (Report of Special Master, pp. 144-145) that the witnesses of the defendant and the intervenor have under-estimated the effect of the operation of the

New York plan on the recreational uses of the Delaware River.

7. To the finding of fact or conclusion of law (Report of Special Master, p. 146) that the recreational public will be apt to ascribe to the diversion any unsatisfactory conditions of the river.

8. To so much of finding of fact numbered 32 (Report of Special Master, p. 205) as finds that the proposed diversion will have any adverse effect whatever upon the sanitary condition of the Delaware River.

9. To so much of finding of fact numbered 34 (Report of Special Master, p. 205) as finds that the proposed New York diversion will have any adverse effect whatever on the waters of the Delaware River for industrial uses.

10. To so much of finding of fact numbered 33 (Report of Special Master, p. 205) as finds that the proposed New York diversion will have any adverse effect whatever on the Delaware River as a source of municipal water supply.

11. To so much of finding of fact numbered 35 (Report of Special Master, p. 205) as finds that the proposed New York diversion will have any adverse effect whatever upon agriculture and the cultivation of New Jersey lands bordering on the Delaware River.

12. To so much of finding of fact numbered 36 (Report of Special Master, p. 205) in so far as it finds that the proposed New York diversion will have any adverse effect whatever upon the shad industry or the shad fisheries in the Delaware River.

13. To so much of finding of fact or conclusion of law numbered 38 (Report of Special Master, pp.

205-206, 176, 193) as finds or concludes that the effect of diversion on the oyster industry will be to cause somewhat more than slight damage.

14. To the finding of fact or conclusion of law numbered 39 (Report of Special Master, pp. 206, 193) in its entirety.

15. To the conclusion of law (Report of Special Master, p. 126) that it is the duty of New York to see to it that the Delaware River when it leaves New York and flows into New Jersey, shall be in a relatively clean condition.

16. To so much of finding of fact or conclusion of law numbered 32 (Report of Special Master, p. 205) as finds or concludes, or purports to find or conclude, that the Delaware River in the non-tidal section, except as to the portion thereof upstream from Port Jervis, is a relatively clean stream.

B. That the Pennsylvania Plan of Release Should Be Preferred Over the New York Plan of Release.

17. To the imposition (Report of Special Master, p. 191) of the Pennsylvania plan of release, whether in principle or otherwise, upon the quantity of water which the defendant, The City of New York, is allowed to take, except as such waters may be taken by the defendant City in quantities and from sources, as contemplated by its plan, here in litigation.

18. To condition (b) of conclusion of law numbered 54 (Report of Special Master, p. 208) in its entirety, except as to so much thereof, only, as requires releases of water, in accordance with the Pennsylvania plan, when the stage of the river falls below .50 c. s. m. at Port Jervis, and waters are

being diverted therefrom in quantity as contemplated (Amended Answer of the defendant, The City of New York, par. Thirty-first, p. 18) by the plan of the defendant, The City of New York.

19. To the finding of fact or conclusion of law (Report of Special Master, p. 196) that no harm will be done by adopting the Pennsylvania plan of release for the present and testing that plan during the operation of the first development and before the second development becomes effective.

C. That This Cause Be Not Finally Determined By the Decree to Be Entered.

20. To so much of conclusion of law numbered 47 (Report of Special Master, pp. 207, 192-193, 198) as reads "without prejudice."

21. To conclusion of law numbered 48 (Report of Special Master, pp. 207, 195-196) in its entirety.

22. To conclusion of law numbered 55 (Report of Special Master, pp. 209, 197) in its entirety.

23. To the conclusion of law (Report of Special Master, p. 199) that this cause should not be ended by a final decree.

D. Particular Exceptions.

24. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 32) that the plan of the defendant, The City of New York, will not at all affect the fishing, hunting and pursuit of pleasure on the Delaware River, except that for pleasure purposes, the operation of the plan of the defendant City will improve the conditions. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 7.)

25. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 45) that the operation of the plan of the defendant City will not adversely, if at all, or measurably, affect the enterprises and facilities for recreation and pleasure existing in the plaintiff State or elsewhere, nor will it destroy the natural advantages of the Delaware valley as a health and recreational resort or injure any property or vested right of the plaintiff or any of its citizens or sensibly or measurably affect or damage or alter the recreational conditions along any part of the Delaware River and that neither damage nor injury will be caused to any recreational activity or interest. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 10.)

26. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 37) that because of the operation of the plan of the defendant, The City of New York, the low critical flow in the Delaware River will, at all times, after the said plan is put in operation, exceed the critical low flows in the said river as they would exist, had the plan not been put in operation. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 8.)

27. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 38), that the Delaware River is and has been a natural drainage carrier for the sewage and industrial wastes of the municipalities and communities located thereon and on its principal tributaries, and that by far the greater portion of such sewage and industrial waste enters the said river below Tri-State Rock. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 9.)

28. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 72), that no measurable concentration of pollution in the Delaware River will result by reason of the operation of the plan of the defendant City and that no damage or injury to any sanitary condition will be thereby caused, but, to the contrary, because of the reserve flow which will be released under the plan, the condition of the river at all critical levels of the water will be improved and the concentration of pollution will be decreased. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 14.)

29. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 40), that the operation of the plan of the defendant, The City of New York, will not sensibly, measurably, or in any injurious manner, alter or modify the effects of floods or their action, if any, in cleansing or purging the river below Tri-State Rock at any season of the year. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 9.)

30. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 71), that the operation of the plan of the defendant City will not observably, sensibly, or measurably, affect the sanitary conditions at any point along the Delaware River. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 14.)

31. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 42), that the operation of the plan of the defendant City will produce only the slightest of effects on the oyster grounds in

Delaware Bay, and these effects, if they could be measured, would not be injurious, and that the natural changes, occurring from season to season in Delaware Bay, are far greater than anything which could possibly be attributed to a diminution of fresh water supply in the said bay because of the operation of the plan of the defendant City. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 9.)

32. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 51), that the existing water supply system of the defendant, The City of New York, is not operated at a profit or for the purposes of profit, and that the plan of the defendant City sought to be enjoined by the plaintiff does not contemplate profit to the defendant City and contains no provision for operation at a profit. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 11.)

33. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 54), that the operation of the plan of the defendant City will not deprive the plaintiff or its citizens of any water to which it or they are entitled. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 12.)

34. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 59), that the operation of the plan of the defendant City will not take any property of the plaintiff or its citizens. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 13.)

35. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 81), that the operation

of the plan of the defendant City will not be noticeable or apparent, or visible, to any user, below Tri-State Rock, of the waters of the Delaware River, nor to any person living along its shores, and that this plan will do neither damage nor injury of any serious, measurable or demonstrable magnitude to any person or interest at any point along the Delaware River. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 16.)

36. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 83), that the operation of the plan of the defendant City will cause no damage or injury, more than trivial, to any person or any interest at any point along the Delaware River. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 17.)

37. To the failure and refusal of the Special Master to find as requested by the defendant City (Proposed Finding of Fact, 86), that no substantial interest of the plaintiff or of any of its citizens or inhabitants is actually or presently threatened or interfered with to any serious degree by the plan of the defendant City and that none will be occasioned by the operation of said plan. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 17.)

38. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, 1) that for any injury or damage which may occur to, or be sustained by, the plaintiff or any of its citizens or inhabitants by reason of the operation of the plan of the defendant City there is a plain, adequate and complete remedy at law. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 17.)

39. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, II.) that the plaintiff has not established by clear and convincing evidence that any invasion of its rights or those of its citizens or inhabitants is of serious magnitude or is threatened by the operation of the plan of the defendant City. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 17.)

40. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, III.) that the injuries which the plaintiff claims will be occasioned by the operation of the plan of the defendant City are wholly conjectural and speculative. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 18.)

41. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, VII.) that the plan of the defendant, The City of New York, sought to be enjoined, fully respects the interest of the plaintiff State and its citizens and inhabitants in the waters of the Delaware River. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 18.)

42. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, VIII.) that the operation of the plan of the defendant City will not involve the taking of more than the equitable share of the State of New York in the waters of the Delaware River. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 18.)

43. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, IX.) that the operation of the plan of the defendant City will not inequitably deprive the plaintiff State, or any of its citizens or inhabitants, of any benefit derived from or arising out of the waters of the Delaware River. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 18.)

44. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, XII.) that the operation of the plan of the defendant City does not involve the direct taking of any estate of the plaintiff, or of any person, in any lands within the State of New Jersey. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 19.)

45. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, XIII.) that the operation of the plan of the defendant City will not interfere with the enjoyment by the plaintiff, or any person, of any estate in lands within the State of New Jersey. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 19.)

46. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, XIV.) that the operation of the plan of the defendant City does not involve any substantial or serious damage to the plaintiff or to any person owning lands in the State of New Jersey, and does not seriously or substantially invade any right of the plaintiff or any such person. (Defendant

City's Proposed Findings of Fact and Conclusions of Law, p. 19.)

47. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, XX.) that the operation of the plan of the defendant City does not involve any use of the waters of the Delaware River beyond that to which the State of New York is entitled. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 20.)

48. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, XXVI.) that the part or portion of the waters of the tributaries of the Delaware River allocated by the defendant, State of New York, to the defendant, The City of New York, for the purposes of its water supply, is not unreasonable or improper in amount, and not in excess of a fair and equitable share of the State of New York in the waters of the said river. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 21.)

49. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, XXVII) that the allocation of the aforesaid waters of the tributaries of the Delaware River by the defendant, State of New York, to the defendant, The City of New York, for the purposes of its water supply is not unjust, unfair or inequitable to the plaintiff, State of New Jersey, or the intervenor, Commonwealth of Pennsylvania, and is not subject to challenge or controversy by the plaintiff or the intervenor or the citizens of either of them. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 21.)

50. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, XXVIII) that the defendant, State of New York, has an irrefragible right to use the waters of the tributaries of the Delaware River, which are involved in this controversy, for the benefit of its people and that the portion of such waters to be used by the defendant, The City of New York, pursuant to the authorization of the defendant, State of New York, is reasonable. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 21.)

51. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, XXXV) that, upon the facts adduced at the hearings, no cause for relief of any kind was established by the plaintiff against the defendants or either of them. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 23.)

52. To the failure and refusal of the Special Master to conclude, as a matter of law, as requested by the defendant City (Proposed Conclusion of Law, XXXVI) that the defendants are entitled to the decree of this Court dismissing the Bill of Complaint herein. (Defendant City's Proposed Findings of Fact and Conclusions of Law, p. 23.)

E. Recommendations for Decree.

The defendant, The City of New York, also objects and excepts to the recommendations for a decree made by the Special Master in the following particulars:

53. To subdivision numbered 3 (Report of Special Master, p. 209) in its entirety.

54. To subdivision numbered 4 (Report of Special Master, pp. 209-211) except as to paragraph (c), on page 211, thereof.

55. To subdivision numbered 7 (Report of Special Master, p. 211) insofar only as it contains the words "without prejudice."

56. To subdivision numbered 9 (Report of Special Master, p. 212) in its entirety.

57. To subdivision numbered 10 (Report of Special Master, p. 212) in its entirety.

58. To the refusal of the Special Master to recommend as suggested by the defendant, The City of New York (Proposed Findings of Fact and Conclusions of Law and Recommendations for Decree, submitted to the Special Master by the defendant, The City of New York, p. 23) that the Bill of Complaint be dismissed upon the merits.

Respectfully submitted,

ARTHUR J. W. HILLY,
Corporation Counsel,
Solicitor for the Defendant,
The City of New York.

J. Joseph Lilly,
Frank H. Deal,
Frank J. Coyle,
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Of Counsel.

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CHARLES ELMORE CROPLEY
CLERK

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Sup. Ct.

DELAWARE RIVER DIVERSION CASE

IN THE

Supreme Court of the United States

OCTOBER TERM, 1930.

No. [redacted] riginal. [redacted] 5

STATE OF NEW JERSEY,

Plaintiff,

vs.

STATE OF NEW YORK and CITY OF NEW YORK,

Defendants.

COMMONWEALTH OF PENNSYLVANIA,

Intervener.

Plaintiff's Brief on Exceptions to the Report of the Special Master.

WILLIAM A. STEVENS,
Attorney-General.

DUANE E. MINARD,
Assistant Attorney-General,
Solicitors of Plaintiff.

April 13, 1931.

JAMES M. BECK,
GEORGE S. HOBART,
Special Counsel.

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IN THE

Supreme Court of the United States.

OCTOBER TERM, 1930.

No. 16, Original.

STATE OF NEW JERSEY, *Plaintiff,* *vs.* STATE OF NEW YORK AND CITY OF NEW YORK, *Defendants.* COMMONWEALTH OF PENNSYLVANIA, *Intervenor.*	*On Exceptions to the Report of the Special Master.*

BRIEF IN SUPPORT OF PLAINTIFF'S EXCEPTIONS.

(1)

STATEMENT OF THE CASE.

This is an original action brought pursuant to a resolution of the Legislature of the plaintiff to restrain the threatened diversion of waters from certain tributaries of the Delaware River, for the purpose of water supply for the City of New York (Laws of N. J. 1929 p. 823, Ex. 1). At the time the bill was filed, on May 22, 1929, the State of New York had not given its approval to the plans of the City of New York for such diversion, but such approval was thereafter given.

By order dated January 6, 1930, the petition of the Commonwealth of Pennsylvania to intervene was allowed (280 U. S. 528); and thereafter Pennsylvania filed a statement of its interest and of the relief desired by it (R. 4593).

On January 27, 1930, this Court referred the cause to Hon. Charles N. Burch, of Memphis, Tennessee, as Special Master, to take evidence and to make findings of fact and conclusions of law and submit his report with recommendations for a decree (280 U. S. 533).

Pursuant to this order, testimony was taken by all of the parties, beginning April 21, 1930, and concluding September 19, 1930, occupying forty-three days.

Oral argument was heard before the Master on November 17th to November 20, 1930, and on February 2, 1931, he filed his report and recommendations (R. 4752).

All the parties (other than the Commonwealth of Pennsylvania) have filed exceptions to this Report and recommendations and the case now comes before this Court on such exceptions.

The plaintiff has filed forty-two exceptions, the City of New York fifty-eight, and the State of New York seventeen.

The testimony has been printed and bound in forty-three volumes, which have been assembled in nine volumes, as follows:

		Pages
Plaintiff's Testimony Vols	1-5	1-464
" " "	6-10	465-1070
" " "	11-15	1071-1639
" " "	16-20	1640-2278
Defendant's Testimony Vols....	21-25	2279-2713
" " "	26-30	2714-3170
Pennsylvania's Testimony Vols..	31-34	3171-3524
" " " ..	35-38	3525-3950
Plaintiff's Rebuttal Vols.	39-43	3951-4534

The original transcript of the testimony consists of 7,507 typewritten pages which, in printed form, consist of 4,534 pages.

By permission of the court and stipulation of the parties, the testimony thus printed is to be considered as the printed record of the testimony on the hearing of the exceptions.

Exhibits were offered as follows:

By the plaintiff—Nos. 1 to 300 and 300-A to 300-Q.

By New York State and City—Nos. 301 to 364.

By Pennsylvania—Nos. 401 to 440.

The original exhibits are on file in this Court but have not been reproduced in printed form.

By stipulation, all parties have leave in their briefs and arguments to refer to the exhibits and to print all or any part thereof as part of the briefs.

For convenience, a duplicate set of the exhibits has been assembled and bound in 17 volumes, as follows:

1.	Plaintiff's Exhibits	1-20
2.	" "	21-70
3.	" "	71-149
4.	" "	150-198
5.	" "	199-282
6.	" "	283-300 and 300-A-300-Q
7.	Defendant's Exhibits	301-324
8.	" "	325
9.	" "	326-333
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12.	Pennsylvania's Exhibits	401-412
13.	" "	413
14.	" "	414
15.	" "	415
16.	" "	416-420
17.	" "	421-440

An additional volume (No. 44) has been printed containing copies of the pleadings, stipulation as to record and exhibits (including descriptive list of exhibits, index to witnesses and subject index to testimony), the findings of fact and conclusions of law as proposed by the several parties, the Report of the Special Master, and the exceptions thereto.

All references herein are to the printed record by pages and to the exhibits by number.

Summary of Pleadings.

The following summary of the pleadings is based upon the Master's Report (pp. 6-12; R. 4752-4758).

The Bill of Complaint.

The object of the suit is to enjoin the State of New York and the City of New York and all persons acting under their authority "from diverting or abstracting any waters from the Delaware River, or from any of its tributaries, and particularly from the Neversink River, Willowemoc River, Beaver Kill, East Branch of the Delaware River and Little Delaware River, or either, or any part of either of them."

The bill is filed by the State of New Jersey to protect the interests of the State of New Jersey and its people. The bill alleges that the Delaware River is an interstate stream, rising in the State of New York, and constitutes the boundary between the States of New York and Pennsylvania from a point near Deposit, New York, to a point near Port Jervis, New York, the last mentioned point being known as Tri-State Rock and said point being a corner of the states of New York, New Jersey and Pennsylvania; and that from Tri State Rock southwardly, the Delaware River constitutes the boundary between Pennsylvania and New Jersey to a point near Chester, Penn-

sylvania, and thereafter the Delaware River and Delaware Bay constitute the boundary between the States of New Jersey and Delaware.

The bill alleges that the Delaware River has certain tributaries located in the State of New York, to-wit: Neversink River, Willowemoc River, Beaver Kill, East Branch and Little Delaware, and that from these five tributaries the defendants propose at an expense of more than $272,000,000 to make the diversions of water complained of, from the Delaware River watershed to the Hudson River watershed.

Plaintiff states that it is the riparian owner of 23.33 acres of land on the Dalaware River located in the City of Trenton, said land being used by the State for its capitol building and other purposes and that it is also the riparian owner of 292 acres of land at Washington's Crossing in Mercer County, said land being used as a public recreation park, and that below Trenton in the tidal portion of the Delaware River said plaintiff state owns the bed of the stream and bay to the center of the channel. It is alleged that the City of New York, acting under the authority claimed to have been conferred upon it by the State of New York, has completed plans and is about to begin the construction of dams in the tributaries above mentioned and from the waters so stored, said city, by means of tunnels and aqueducts, will divert to the water supply of the City of New York the equivalent of six hundred million gallons of water daily. The bill states the streams from which the proposed diversion is to be made, the location of the dams, the square miles of watershed above the dams and the quantity of diversion from each place of storage, as follows:

Stream	Dam at	Watershed Sq. Miles Above Dams	Diversion (Gals. per Day)
Neversink	Curry	70	70,000,000
East Branch of Delaware	Downsville	370	370,000,000
Beaver Kill	Beaver Kill	60	60,000,000
Willowemoc	Parkston	60	60,000,000
Little Delaware	Delhi	50	40,000,000
	Total		600,000,000

The bill alleges that the proposed diversion will irreparably injure the State of New Jersey and its people in a number of particulars. It is alleged that the proposed diversion:

(1) Will constitute an obstruction to and adversely affect the navigability and navigable capacity of the Delaware River, without the affirmative authority of Congress having been obtained, and without the authority of the Secretary of War and without the consent of the plaintiff.

(2) Will deprive the State and its citizens as riparian owners along the Delaware River of the natural, unobstructed and undiminished flow of its waters in violation of their rights under the common law as adopted and applicable in New York and New Jersey.

(3) Will injuriously affect water power rights of plaintiff and plaintiff's citizens and the ability of plaintiff and its citizens to develop water power on the Delaware River.

(4) Will injuriously affect the sanitary condition of the Delaware River.

(5) Will injuriously affect the industrial use of Delaware River water.

(6) Will have the affect of increasing the salinity of the water in the lower part of Delaware River and in Delaware Bay so as to affect injuriously the planting and production of oysters, and the oyster industry generally in New Jersey.

(7) Will injuriously affect the shad fisheries in the Delaware River.

(8) Will injuriously affect the municipal water supply of towns and cities in New Jersey on the Delaware River.

(9) By lowering the level of the Delaware River will injuriously affect the farming and cultivation of lands on the Delaware River.

(10) Will injuriously affect the use of the river for recreational purposes.

The bill also alleges that the proposed diversion means the taking of water from the Delaware River watershed to the Hudson River watershed, and that the water so taken will never return to the Delaware River.

The bill further alleges that there is no necessity for this diversion as the City of New York has other available sources of water supply from intrastate streams within the State of New York as well as other sources and that water can be taken from these sources without being diverted from one watershed to another and without affecting any other state. Other sources of water supply are alleged to be the Hudson River and certain streams in the Hudson River watershed in the State of New York, and ground waters on Long Island, and it is alleged that suitable water can be obtained from these sources in sufficient quantities.

The bill also alleges a wasteful use by New York City of its present water supply and an insufficient meterage of water used by New York City and that the water rates in New York have not been changed for more than half a century.

The bill also alleges that the carrying out of the plan of the City of New York will violate the Federal Water Power Act and that the proposed diversion will interfere with and regulate interstate commerce; will prefer the

ports of the State of New York to the ports of the State of New Jersey, and will take the property of plaintiff and its citizens without due process of law—all in violation of the Constitution of the United States. (Report pp. 6-9, R. 4752-4755.)

The Answers.

The answers of the State of New York and City of New York generally deny the allegations of the bill, and particularly deny any injurious effect of the proposed diversion.

The answers, however, admit that the City of New York, acting under the authority of the State of New York, is preparing to construct the storage reservoirs mentioned in the bill; that said storage reservoirs are located entirely within the State of New York and more than 30 miles from the channel of the Delaware River where it constitutes the boundary between the States of New York and Pennsylvania; that said storage reservoirs are on streams wholly within the State of New York and that said streams are non-navigable; that the diversion of water will amount to two hundred and nineteen billion gallons per annum, which is the equivalent of diversion at the rate of six hundred million gallons per day; that said diversion, instead of being injurious, will be beneficial; that the substantial effect of the diversion is to take out of the river flood and waste waters which flow to the sea without being of benefit to anyone but on the other hand which are injurious; that the plan of the City of New York in addition to the diversion also provides that there shall be released from the storage reservoirs every day during the months of July, August, September and October of every year a flow of water equal to .45 cubic feet per second for each square mile of drainage area above the point of storage, and that a similar release will be made on each dry day during the eight remaining months of the year, that is, on each day on

which the flow from the drainage area above the point of storage is less than .45 cubic feet per second per square mile of drainage area above said point of storage; that said releases of water from the reservoirs during the months of July, August, September and October and on other dry days during the remaining eight months will be of great benefit to the river and to all those owning lands along the river.

The answers also set up that the states of New York New Jersey and Pennsylvania had appointed commissioners to prepare a compact governing the use and conservation of the waters of the Delaware River and of the tributaries thereof and that the commissioners of the three states had agreed upon a compact and that this compact was adopted by an act of the Legislature of the State of New York (chapter 177 of the Laws of New York of 1925), but that said compact was not adopted by the Legislatures of the states of New Jersey and Pennsylvania; that thereafter commissioners were again appointed by the three states and a unaminous agreement was reached by these commissioners recommending a compact relative to the conservation and use of the waters of the Delaware River and the tributaries of the Delaware River and that this second compact was adopted by the Legislature of the State of New York (Chapter 682 of the Laws of New York of 1927) but that this compact was not adopted by the Legislatures of New Jersey and Pennsylvania; and it is further alleged that the diversion proposed to be made from the tributaries of the Delaware River is in accordance with the principles of the compact last mentioned.

The answers also allege an imperative need of New York City for an additional municipal water supply. (Report pp. 9-11, R. 4756-4758.)

Intervention of Pennsylvania.

The Commonwealth of Pennsylvania filed a statement of its interest and of the relief desired by it. In its statement of interest the Commonwealth of Pennsylvania alleges:

(1) That the interest of Pennsylvania in the water resources of the Delaware River and its tributaries lies in the development thereof through regulated control of storage and release of waters from impounding dams which will tend towards reduction of flood flows and the increase of low water flows and bring about the best utilization of said water resources;

(2) That a number of municipalities of Pennsylvania obtain their supply of water from the Delaware River and its tributaries and that in the future there will be greater need of water from said river and its tributaries for the supply of municipalities in Pennsylvania; that in particular the City of Philadelphia, which at present obtains its water supply from the Delaware River and the tributaries of the upper Delaware River for additional water supply and that the application of the principles set forth in the bill of complaint of New Jersey will prevent the future development of the Delaware River and its tributaries above tide water as a source of water supply for Philadalphia and other Pennsylvania municipalities.

(3) That Pennsylvania desires to cross-examine witnesses and, if necessary, prevent evidence on the question as to whether the proposed impounding and diversion by the City of New York will work material damage to Pennsylvania, its municipalities and its inhabitants and also present evidence disclosing the present and reasonable future needs of Delaware River by Pennsylvania and its municipalities.

Pennsylvania, in its prayer for relief, states that it will desire relief at the hands of the court if, upon the hearing, it develops:

1. That the proposed impounding and diversion is not in accordance with the fair and equitable division of the water of the Delaware River and its tributaries among the States of New York, New Jersey and Pennsylvania.

2. Relief is asked if the plan of the City of New York does not contemplate a proper release of water for increasing the low water flow of the Delaware River.

3. Relief is asked if it develops that the proposed impounding and diversion will work material damage to the present or reasonable future interest and needs of Pennsylvania.

4. That it will ask relief against any unrestricted plan of the State or City of New York in the impounding and diversion of waters.

5. That it will also ask relief against any adjudication that any diversion allowed the City of New York shall constitute a prior appropriation and will insist that any such diversion shall be taken reasonably into account in any subsequent or final allocation of the waters of the Delaware River and its tributaries among the states of New York, New Jersey and Pennsylvania. (Report pp. 11, 13, R. 4758.)

Description of Delaware River and Watershed.

A general description of the Delaware River and its tributaries, and of their watershed, including the water yield of the diversion area in question, is given by the Special Master at pages 53 to 58, inclusive, of his Report, as follows:

> "The Delaware River rises in the western slopes of the Catskill mountains in the State of New York. There are two branches of the river, one known as the

West Branch and one known as the East Branch. These branches unite at Hancock, New York, and form the Delaware River proper. From Hancock the river flows in a southeasterly direction for a distance of approximately 75 miles to Tri State Rock where it enters the State of New Jersey. From parallel of latitude 42° (north), a few miles above Hancock, the West Branch of the Delaware River and the Delaware River are the boundary between Pennsylvania and New York to Tri State Rock. Port Jervis, New York is about one mile above Tri State Rock. From Tri State Rock the river flows in a southerly direction to the head of tide water at Trenton, New Jersey, the distance being about 120 miles. From Trenton the river flows in a southerly direction as a tidal stream to Delaware Bay. The distance from Trenton to Delaware Bay is about 92 miles. The distance from Hancock to the mouth of the river in Delaware Bay is, therefore, approximately 287 miles (Exhibits 88, 110 and 207).

From Downsville, New York (the location of the largest of the New York dams) to Trenton is approximately 227 miles.

The river is the boundary between New Jersey and Pennsylvania from Tri State Rock to the Delaware-Pennsylvania State Line near Chester, Pennsylvania. It is a large stream and one of the principal rivers of the Atlantic seaboard. At Port Jervis the width of the river is 650 feet at low water and 675 feet at bank-full stage. At Phillipsburg, New Jersey the width of the river is 400 feet at low water and 500 feet at bank-full stage. At Trenton the width of the river is 1246 feet at low water and 1270 feet at bank-full stage (Exhibit 110). The river has high banks and rarely gets out of its banks. It is usually clear and consists of a continued succession of pools and rapids, rendering modern navigation between Hancock and Trenton impossible. It is a very beautiful stream and flows through a country of rare scenic beauty.

South of Hancock the river has a number of tributaries; the principal tributaries in New York are the East and West Branch which unite at Hancock, the Mongaup River and Neversink River. The principal

Pennsylvania tributaries are the Lackawaxen River, Lehigh River and Schuylkill River. The principal New Jersey tributaries are Pauling Kill, Pequest River and Musconetcong River.

The decided slope of the river is indicated by the fact that the zero point on the gauge at Port Jervis is 414.9 feet above mean sea level, zero point at Phillipsburg is 155.4 feet above mean sea level and zero point at Trenton is 7.5 feet above mean sea level (Exhibit 110).

* * * * *

The drainage area above Port Jervis is 3070 square miles, above Tri State Rock 3415 square miles, above Belvidere, New Jersey, 4540 square miles, above Riegelsville, 6190 square miles, above Trenton, 6800 square miles, above Delaware State Line, 10,444 square miles, above Arnold's Point at the upper end of the natural oyster beds, 11,420 square miles, above Deep Water Point, Delaware, 12,027 square miles, and above Capes May and Henlopen, 13,660 square miles.

Of the 3415 square miles of drainage area above Tri State Rock (which is at the point where the Delaware enters New Jersey) there are 2389 square miles in New York, 1016 square miles in Pennsylvania and 10 square miles in New Jersey. New York City proposes to develop 610 square miles on tributaries of the Delaware,—all 610 square miles being within the State of New York. The 610 square miles thus proposed to be developed are about 25.5% of the whole Delaware River drainage area within the State of New York; about 17.8% of the drainage area of the Delaware River above Tri State Rock; and about 8.9% of the drainage area above Trenton, about 5.3% of the drainage area above Arnold's Point, and about 4.5% of the drainage area above Capes May and Henlopen.

The water yield of the 610 square miles of diversion area is approximately 2.2 cubic feet per second per square mile."

The Proposed Plan.

The plan of the defendant city to divert waters from the Delaware tributaries in question is described in a letter, dater July 27, 1927, and an accompanying report, from the Board of Water Commissioners to the Mayor, (Pl. Exhibit 4), the essential parts of which are as follows: (Page references are to Exhibit 4).

"(p. 2) The flood waters of the Delaware will be stored in reservoirs provided for that purpose and conveyed into a reservoir in the Rondout Valley, from which place a tunnel deep in the rock and 49 miles long will carry them into the present West Branch Reservoir, on the Croton watershed. Another tunnel will extend from the West Branch Reservoir to Kensico Reservoir and thence to Hill View Reservoir, where connection will be made with both the present Catskill delivery tunnel and the new delivery tunnel authorized by your Board on March 10, 1927.

* * * * * *

The plan proposed will naturally be developed in three stages, as follows:

First: Water from the Rondout, together with the flood water from the Neversink, will make available 140 to 170 million gallons daily.

Second: The flood waters of the East Branch will be added and bring the available supply up to from 510 to 540 million gallons daily.

Third: The Little Delaware, Willowemoc and Beaver Kill will yield 160 million gallons daily of flood waters and bring the total up to 670 to 700 million gallons daily."

"The reservoirs to be constructed under the proposed plan will be operated in such manner as to withhold water from the tributaries on which they are located only when the flow therein is greater than the ordinary flow; at all other times the ordinary flow will be maintained. Moreover, during July, August, September and October, irrespective of the flow in the tributary water may be released from these reservoirs in such manner that the ordinary flow will be continu-

ously maintained. The effect of so operating the storage reservoirs will, on the one hand, be to diminish the flood flows in the Delaware while on the other the low season flows will be augmented and increased. The increase in the low season flows will thus be in proportion to the dryness of the season,—that is to say, the drier the year, the greater will be the proportinate increase in flow in the Delaware River."

"THE COST OF THE PLAN.

(p. 3) The estimated cost of all the constructions necessary to provide a new and additional supply of 510 to 540 million gallons daily delivered into Hill View Reservoir, together with similar delivery of 100 million gallons daily of water from the higher levels of the Croton watershed, is $272,587,000."

(p. 13) "SOURCES TO BE APPROPRIATED

In view of the foregoing, your Engineer recommends for the consideration of the Board of Water Supply a plan for a new and additional supply of water which will involve the appropriation by the City of New York of water from the following named sources; these waters to be taken under the plan hereinafter outlined and as shown on the accompanying map, plan and profile, Acc. 30857.

(p. 14) (1) East Branch of the Delaware River near Downsville,

(2) Little Delaware River near Delhi,

(3) Beaver Kill near Beaver Kill,

(4) Willowemoc Creek near Parkston,

(5) Neversink River near Curry,

(6) Rondout Creek near Montela.

ESTIMATED YIELD OF SOURCES TO BE APPROPRIATED

		m. g. d.
(1)	East Branch watershed, about 370 square miles with storage near Downsville	370
(2)	Little Delaware River watershed, about 50 square miles with storage near Delhi	40
(3)	Beaver Kill watershed, about 60 square miles with storage near Beaver Kill	60
(4)	Willowemoc Creek watershed, about 60 square miles with storage near Parkston	60
(5)	Neversink River watershed, about 70 square miles with storage near Curry	70
(6)	Rondout Creek watershed, about 100 square miles with storage near Montela	70 to 100
	Total available yield of the above source	670 to 700

Of the above it will be noted that the first five items, representing 600,000,000 gallons daily, are sources tributary to the Delaware River, but no one of them will be taken at any point nearer the channel of that river than 30 miles. All of the above sources will naturally not be developed at one time, but the main aqueducts will be constructed of sufficient capacity to eventually take the full quantity.

THE FIRST STAGE OF THE DEVELOPMENT

The first steps in the development of the plan will include the construction of the reservoirs on Neversink River and on Rondout Creek, together with the tunnel connecting the Neversink and Rondout and the aqueduct tunnel to the present West Branch Reservoir on the Croton watershed. At the same time the main aqueduct will be constructed from the West Branch Reservoir to Kensico Reservoir and thence to Hill

View Reservoir, connections being made with the higher level Croton Reservoirs, so as to bring about the delivery of 100 million gallons daily of that water into Kensico Reservoir, all as shown on the accompanying map, plan and profile, Acc. 30857.

This first stage of the development will make available from 140 to 170 million gallons daily of new and additional water, and will also provide for delivering 100 million gallons daily of present low level Croton water into Kensico Reservoir.

THE SECOND STAGE OF THE DEVELOPMENT

As the constructions above outlined approach completion, work on the second stage will be begun with the building of the reservoir on the East Branch of the Delaware and the driving of the tunnel through to the Rondout Valley. The completion of this second stage will make available 370 million gallons daily more of (p. 15) new and additional water and bring the total for the new system up to from 510 to 540 million gallons daily.

(p. 15) THE THIRD STAGE OF THE DEVELOPMENT

As more distant future developments may require, the reservoirs on the Little Delaware River, the Beaver Kill and the Willowemoc Creek will be constructed, together with the necessary connecting tunnels. These sources will make available a further supply of 160 million gallons daily and complete the system. If and as necessary, the third stage may also include an aqueduct extending north from the West Branch Reservoir to other sources in Dutchess and Columbia Counties, thus making available a still further quantity of 180 million gallons daily.

In connection with the operation of the reservoirs on the tributaries of the Delaware River, it is to be noted that provision will be made for releasing reserve flows in the manner and to the quantities agreed upon in the two forms of compact negotiated by commissions representing the States of New York, New Jersey and Pennsylvania. The taking of these waters will consequently be a taking of flood waters only. The low season flows in the Delaware will be

substantially augmented and only the flood flows will be reduced. The reserve flows to be released will be 0.45 cubic foot per second per square mile of drainage area developed and such flows will be maintained continuously during July, August, September and October as well as on other days during the year when the flow from the drainage area falls below 0.45 cubic foot per second per square mile of drainage area above the point of storage."

"(4) The West Branch Reservoir, on the Croton watershed, will be utilized for the purpose of regulating and equalizing the flow through the tunnel from the Rondout. This reservoir will also serve as a settling basin for the removal of turbidity, when and as necessary. For faciliating the settling action, a coagulating plant will be provided above the point where the aqueduct will enter the West Branch Reservoir."

The Effect of the Plan.

After reviewing the testimony of the witnesses in pages 58 to 74, inclusive, the Special Master states the following conclusions respecting the effect upon the river, both in water level reduction by inches and in volume of flow reduction by percentages, as follows:

"To summarize, I find that under the operation of the New York plan, the level of the river on an average will be lowered at Tri State Rock during the summer period (May-October) about 1⅞ inches and during the winter period (November-April) about 3⅝ inches, and at Trenton the river will be lowered on an average about 1½ inches during the summer period, and about 2⅜ inches during the winter period, and that the average annual discharge of the river at Tri State Rock will be reduced about 14.6% to 16% and at Trenton about 8.3% and at the location of the natural oyster beds about 5%."

(R. 4825; Rep., p. 74).

The Master's Recommendations for a Decree.

The following summary is based upon Part XXVI, pp. 209-212 of the Master's Report:

1. Denying the injunction to the extent that it seeks to restrain the State and City of New York from diverting *any water whatever* from the river or its tributaries.

2. Denying the injunction to the extent that it seeks to restrain the State and City from diverting the equivalent of 440 million gallons of water daily.

3. Granting an injunction to restrain any diversion "in excess of the equivalent" of 440 m. g. d.

4. Providing that the denial of the injunction against diverting the equivalent of 440 m. g. d. is subject to the following conditions:

(a) Sewage plant to be constructed at Port Jervis, New York, so as to effect a reduction of 85% in the organic impurities, and to reduce B. coli by 90%; untreated industrial waste from plants in said town to be allowed to enter the river.

(b) Whenever the stage of the river falls below .50 c. s. m. at Port Jervis or Trenton, or both, (.50 c. s. m. being equivalent to a flow of 1535 c. f. s. at Port Jervis and 3400 c. f. s. at Trenton), water to be released from one or more of the reservoirs in sufficient volume to restore the flow at Port Jervis and Trenton to 50 c. s. m., provided, the release is not to be in excess of 30% of the diversion area yield, that is, the maximum release shall be 30% of 2.2 c. s. m. or .66 cubic feet per second per square mile at other areas from which the water is diverted.

The Neversink River to be treated as though it flowed into the Delaware River above Port Jervis, and the number of second feet of water released from the reservoir shall be added to the number of second feet of water released from other reservoirs to determine whether the quantity of water has been released.

(c) New Jersey and Pennsylvania to have the right to inspect the dams and reservoirs and the diversion areas and the inflow, and to inspect the meters and all records pertaining to the flows.

5. Providing the diversion shall not be "a prior appropriation."

6. Providing that the prayer of Pennsylvania to allocate to 750 m.g.d. from the Delaware River or its Pennsylvania tributaries be denied without prejudice.

7. Providing that the prayer of Pennsylvania for the appointment of a river master be denied without prejudice.

8. Providing that the decree is without prejudice to the United States and is subject to the paramount authority of Congress with respect to navigation and navigable waters of the United States.

9. The cause to be retained in court and that any party may apply for relief as to any matter determined without prejudice, and also to modify the provisions of section 4 (a, b, and c.)

10. The diversion of 440 m.g.d. means that the total quantity diverted in any year divided by the number of days in the year shall not exceed 440, the same principle to apply to any less diversion.

11. Providing for a division of costs (R., 4970).

Plaintiff's Exceptions

Plaintiff has filed forty-two exceptions which have been assembled and will be argued under the following heads:

		Nos. of Exceptions
I.	Riparian Rights Under Common Law	1 -9
II.	Necessity for the Diversion	10-17
III.	Navigation	18-22
IX.	Water Power	24-29
V.	Industrial Uses	30-34
VI.	Equitable Regulation	35-38
VII.	The Master's Plan	39-42

(R., 4980).

(2)

JURISDICTION.

Jurisdiction is based upon the following:

Article III, Section 2, Constitution of the United States; Section 341, Title 28, U. S. C. A. (p. 171); *Kansas* v. *Colorado*, 206 U. S. 46; *Wyoming* v. *Colorado*, 259 U. S. 419; *Wisconsin* v. *Illinois*, 278 U. S. 367; *Georgia* v. *Tennessee Copper Co.*, 206 U. S. 230; *Pennsylvania* v. *Wheeling & Belmont Bridge Co.*, 54 U. S. 518; *New York* v. *New Jersey*, 256 U. S. 296.

(3)

SUMMARY OF THE ARGUMENT.

I.

Riparian Rights Under Common Law

The common law rule of riparian rights is applicable to this case for the following reasons:

(a) That rule is in effect in all three states and none of the states has passed any statute authorizing the proposed diversion.

(b) The proposed diversion will cause substantial damage to the plaintiff and its citizens.

(c) The defendant city has suitable and adequate sources of water supply within its natural watershed which can be used without injury to the plaintiff and its citizens.

II.

Necessity for Diversion

There is no necessity for the proposed diversion; at most it is merely a matter of convenience, which is insufficient to justify a diversion from a foreign watershed in which other states have natural rights that would be substantially damaged thereby.

III.

Navigation

The proposed diversion will substantially affect the navigation in, and the navigable capacity of, the Delaware river and of the tributaries in question; and the defendant city has not complied with the conditions precedent prescribed by Congress.

IV.

Water Power

The proposed diversion will cause substantial damage to the plaintiff and its citizens by impairing property rights that are dependent upon the existence of water power appurtenant to their riparian lands.

V.

Industrial Uses

The proposed diversion will cause substantial damage to the plaintiff and its citizens by increasing the hardness of the water used and useable for industrial purposes and thereby impair the present and future industrial development of the plaintiff's territory and depreciate the value of the lands of the plaintiff and its citizens.

VI.

Equitable Regulation

If the defendant city is entitled to divert waters from the tributaries in question, it should be required to do so in the manner which will cause the least damage to the plaintiff and its citizens.

VII.

The Master's Plan

The conclusion of the Special Master that substantial damage to the plaintiff and its citizens could be removed by reducing the volume of the diversion proposed by New York and by modifying the plan of release from impounding reservoirs during periods of low flow, was not within the issues raised by the pleadings and is unsupported by any evidence.

(4)

ARGUMENT.

I.

Riparian Rights Under Common Law

The common law rule of riparian rights is applicable to this case for the following reasons:

(a) That rule is in effect in all three states and none of the states has passed any statute authorizing the proposed diversion.

(b) The proposed diversion will cause substantial damage to the plaintiff and its citizens.

(c) The defendant city has suitable and adequate sources of water supply within its natural watershed which can be used without injury to the plaintiff and its citizens.

The Common Law Rule

The allegations of the complaint respecting the rights of plaintiff and its citizens under the common law are set forth in full at pages 14 to 16, inclusive, of the Special Master's Report. At page 16 he states the common law as follows, in a quotation from *United States* v. *Rio Grande Dam and Irrigation Company,* 174 U. S. 702:

> "The unquestioned rule of the common law was that every riparian owner was entitled to the continued natural flow of the stream. It is enough, without other citations or quotations, to quote the language of Chancellor Kent (3 Kent, sec. 439):
>
> " 'Every proprietor of lands on the banks of a river has naturally an equal right to the use of the water which flows in the stream adjacent to his lands, as it was wont to run (currere solebat) without diminution or alteration. No proprietor has a right to use the water, to the prejudice of other proprietors, above or below him, unless he has a prior right to divert it, or a title to some exclusive enjoyment. He has no property in the water itself, but a simple usufruct while it passes along. *Aqua currit et debet currere ut currere*

solebat is the language of the law. Though he may use the water while it runs over his land as an incident to the land he cannot unreasonably detain it, or give it another direction, and he must return it to its ordinary channel when it leaves his estate.' (R., 4763).

At pages 17 to 21, inclusive, the decisions of the courts of New Jersey, New York and Pennsylvania are reviewed which show that the common law rule is applied in each of the three states to the right of the owner of the adjacent land or of the bed of the stream to have a stream substantially preserved in its natural size, flow and purity and to protection against material diversion or pollution.

Following are extracts of the Master's conclusions, based upon that discussion:

"I find that, as stated in the bill, the State of New Jersey is the owner of the bed of Delaware Bay and of the bed of the tidal portion of Delaware River adjacent to its shores and extending to the center of the channel. In the non-tidal portion of the Delaware River above Trenton Falls the State is the riparian owner where its Capitol grounds are located and where Washington Park is located. Numerous individuals and corporations own the remainder of the New Jersey shore between Trenton Falls and Tri State Rock. In this non-tidal section of the river, the riparian owners in New Jersey, under New Jersey law, own the bed of the stream to the center of the channel, that is, to the boundary line separating New Jersey and Pennsylvania.

It seems to me quite clear therefore, that if the strict rule of the common law is the rule of law which is applicable, it must necessarily follow that New Jersey is entitled to an injunction since under the New York plan the river will not flow in undiminished volume as it has been accustomed to flow but will be reduced in volume to the extent of the equivalent of 600 million gallons daily. This conclusion is subject to the condition that New Jersey will be substantially injured by the diversion as an injunction will not issue to protect a mere abstract right. *North Dakota* v.

Minnesota, 263 U. S. 365; *New York* v. *New Jersey*, 256 U. S. 296." (R., 4769.)

Since no exceptions have been filed to this conclusion it will be unnecessary to cite cases to support it.

Numerous decisions of this court hold that the rights of riparian owner will be determined by it according to the laws and decisions of the states involved. *St. Anthony's Falls Water Power Co.* v. *Board of Water Commissioners*, 168 U. S. 349; *Hardin* v. *Jordan*, 140 U. S. 371; *Packer* v. *Bird*, 137 U. S. 661; *Barney* v. *Keokuk*, 94 U. S. 324; *St. Louis* v. *Myers*, 113 U. S. 566; *St. Louis* v. *Rutz*, 138 U. S. 226; *Shively* v. *Bowlby*, 152 U. S. 1; *Higuera's* v. *United States*, 72 U. S. 827; *Rundle* v. *D. & R. Canal Co.*, 14 How. 80.

In *Slack* v. *Walcott*, 3 Mason 508, Mr. Justice Story, in delivering the opinion of the Supreme Court of Massachussets, in a case where the riparian rights of a mill owner in Massachussetts were affected by a diversion in Rhode Island of waters from an interstate stream, held that since the right affected constituted an incorporeal hereditament annexed to the freehold in Massachusetts, the mill owner was entitled to a remedy according to the laws of that state. That case is discussed at length by Angell in his treatise on "The Law of Watercourses", (6th Ed.) under the heading "*Lex Loci*, Section 167, p. 322.

The Special Master's finds that the defendant city is not a riparian proprietor on the Delaware River or any of the tributaries involved, but he concludes that this is immaterial to the plaintiff (R. 4769; Rep. p. 21).

At common law only riparian owners were entitled to use the water of flowing streams and then only for purposes, and to the extent, necessary and pertinent to the occupancy of the land. No right existed to divert waters for use on non-riparian lands. *Sparks Mfg. Co.* v. *Newton*,

57 N. J. Eq. 367; *Smith* v. *Rochester*, 92 N. Y. 463, 104 N. Y. 674; *Farnham on Waters, etc.*, pp. 348, 359, 609, 610, 612, 1647, 1648. In the notes in Farnham's work are collected many decisions of the courts of all states, including New Jersey, New York and Pennsylvania, in support of this brief statement of the law.

Express statutory authority is necessary to enable a municipality to obtain a municipal water supply from a flowing stream even though the municipality is located upon that stream (*Trenton* v. *New Jersey*, 262 U. S. 182, 185) and when clothed with that express authority a municipality is still unauthorized to take the water without first acquiring from the lower riparian owners the right to diminish the volume of flow in the stream. This may be done by purchase or condemnation but the legislature of no state can authorize the taking of water for such a purpose so as to injure the rights of the lower riparian owner, unless effective provision is made for compensation first had and obtained under the exercise of the power of eminent domain. *Farnham on Waters, etc.* pp. 359, 609; *Gardner* v. *Newburgh*, 2 Johns. Chy. (N. Y.) 162; *Gallagher* v. *Kingston Water Co.*, 49 N. Y. Supp. 250, Aff. 164 N. Y. 602; *Gilzinger* v. *Saugerties Water Co.*, 21 N. Y. Supp. 121, Aff. 142 N. Y. 633; *Sparks Mfg. Co.* v. *Newton*, 57 N. J. E. 367; *Wilson* v. *East Jersey Water Co.*, 78 N. J. Eq. 329; *Paterson* v. *East Jersey Water Co.*, 74 N. J. Eq. 49, Aff. 77 N. J. Eq. 588; *Angell on Watercourses*, p. 11; *Palmer Water Co.* v. *Lehighton Water Supply Co.*, 280 Pa. 492; *Lackawanna Mills* v. *Scranton Gas and Water Co.*, 150 Atl. Rep. 633, 300 Pa. 303; *Van Etten* v. *City of New York*, 226 N. Y. 483; *Smith* v. *Rochester*, (supra); *Grey* v. *Village of Fort Plain*, 94 N. Y. Supp. 698.

Defendant City is empowered under general laws to provide itself with a water supply, subject to the approval, which it has obtained (Exhibit 14), of the Water Power and Control Commission of the State of New York, (N. Y.

Conservation Law, Art. XI, Sec. 521; Exhibits 2 and 3, p. 57), but no statute expressly authorizes the defendant city to obtain a water supply from an interstate watershed or from the tributaries in question whose waters naturally flow to the plaintiff. In this respect, the defendant city in this case has not the advantage of express statutory authority, as had the Metropolitan District, in *Connecticut* v. *Massachusetts*, decided February 24, 1931 (1930 Term, No. 9, Adv. Op. p. 297).

Regardless of the question of legislative authority, either express or implied, it is the contention of the plaintiff that no state has the authority to act within its own territorial limits in a manner that affects the rights of persons in another state. In this case Delaware River is an interstate stream in which each of the states is entitled to the rights of navigation, fisheries, power, and other benefits and advantages of which they cannot be deprived by the action of another state. In like cases involving international streams it is the inherent right of each nation to defend the advantages by force, but under our federal constitution that power was surrendered by the states in lieu of a judicial determination by this court. The rights of riparian owners in the United States was the subject of diplomatic correspondence in 1880 between Mr. Evarts, Secretary of State, and the Mexican Government when riparian owners on the Mexican side of the Rio Grande undertook to divert waters from that stream. 1 *Moore's Int. L. Dig.* 653. In the United States one state cannot authorize changes in the flow of the stream which will injure property in another state. These great streams are referred to by Farnham thus:

> "The gifts of nature are for the benefit of mankind, and no aggregation of men can assert and exercise such rights and ownership of them as will deprive others having equal rights, and means of enjoying them, of such enjoyment * * *

> One state cannot authorize changes in the river which will injure property in another state. And the upper state cannot divert the water to the injury of property or the destruction of navigation lower down, and attempts to do so will be restrained by courts having jurisdiction of the parties." (*Farnham on Waters*, pp. 29, 30.)

Plaintiff also contends that the defendant state cannot confer, and that the defendant city cannot exercise, any power extra-territorial in its effect. The case of *Pine* v. *Mayor of New York* (112 Fed. 98) was similar to the present case in that particular. The defendant city built its reservoirs in the state of New York to divert waters from the Byram River which flowed into the State of Connecticut. Two riparian owners in Connecticut sued for injunction to restrain the threatened diversion. The trial court firmly held that the authority under which the defendant city claimed the right, which was exactly the same as in this case, to make the diversion, could not apply extra-territorially to justify the taking of property or property rights in Connecticut. That court held (p. 93) as follows:

> "A state cannot enact a statute purporting to authorize property to be taken beyond its boundaries, and deny a remedy to a person wronged unless he resort to and thereby ratify the statute by securing his compensation pursuant to it. In such case the state seizes by wrong and without constitutional rights under the color of statute, and insists that the offended person shall waive the tort, and declare the tortious act a valid act, by seeking his remedy under the very statute which as to him is void and ineffective."

That decision was affirmed by the Circuit Court of Appeals (112 Fed. 98) but this court reversed solely on the ground of laches. (185 U. S. 93.) In other cases the courts have squarely held against the extra-territorial effects of state legislation and the diversion of water. *Octoraro Water Company's Petition*, 15 Pa. Dist. Rep.

767; *Gould on Waters,* 477; *Wooster* v. *Great Falls Mfg. Co.,* 39 Me. 246; *Rutz.* v. *St. Louis,* 7 Fed. 438; *Mannville Co.* v. *Worcester,* 138 Mass. 89; *Saunders* v. *Bluefield Water Works,* 58 Fed. 133; *Slack* v. *Walcott,* 3 Mason 508, 517; *Holyoke Water Power Co.* v. *Connecticut Co.,* 20 Fed. 71; 1 *Farnham on Waters, etc.,* 30.

The plaintiff contends that it, as owner of the bed of tidal waters and as riparian owner of lands on the non-tidal section of Delaware River, as found by the Special Master at page 21 of his report, and plaintiff's citizens as riparian proprietors along the river in the non-tidal section thereof, are entitled to all rights of riparian proprietors under the English Common Law, and that the defendant city by its proposed diversion of water (in any substantial amount) threatens an invasion of such rights of plaintiff and its citizens and that the pretended authority for such diversion conferred by the defendant state is ineffective because of its extra-territorial application.

The Master also refers (pp. 22, 24-27) to instances in each of the three states where diversions of water were authorized by the legislature, in some instances from one watershed to another within the state, for municipal water supply or for canals, which he describes (p. 27) as "the policy of the three states." As the quotations from the testimony (p. 25, 26) show, these diversions were inconsequential *and affected no property outside of the state.* The right to diversion was subject to compensation for any riparian rights affected (p. 22, with cases cited). (R. 4770). These were instances of purely internal control in which no one outside was interested and where the police power of the state was exercised solely for the benefit of its inhabitants. They related to diversions which were only such as the state, "as the guardian of the public welfare may permit for the purpose of turning them to a more perfect use." *Hudson County Water Co.* v. *McCarter,* 209 U. S. 349, 356.

The diversions for canal purposes, referred to in the Master's report at pages 24 to 27, inclusive, were only four in number; One in the State of Pennsylvania where the canal paralleled the river throughout its course, two in the State of New Jersey and one in the State of New York. All of them were authorized by special acts of the legislature applicable, respectively, solely to the company incorporated thereby. The alleged diversion for the Delaware and Hudson Canal, referred to on page 27 of the Master's Report, was authorized by the concurrent acts of the legislature of Pennsylvania and New York. No general law authorizing such diversions was cited, and none exists. Special acts of the legislature applicable only to a single company and a single instance, do not constitute modifications of existing general law, or the adoption of a "policy" in a state. They are the exceptions that prove the rule.

To hold that these instances of purely internal sovereign management which had no extra-territorial effect, established a precedent or "policy" which would justify a diversion of waters by a neighboring state, is analogous to holding that a parent could not indulge his own children in affectionate generosity without assuming a like obligation toward those of his neighbors.

The Special Master holds (p. 22, 23) that if the defendant city is "permitted to carry out its plan, it must make compensation to those who may be injured from a legal standpoint." He also holds that while the New York statutes, under the authority of which New York City acts, make the proposed diversion lawful so far as New York is concerned they cannot have any effect in New Jersey "and cannot legalize the damage of property in New Jersey."

With respect to the defendant city's expression of ability and willingness to pay damages for injuries in New

Jersey, the Special Master holds that this willingness "would not render lawful or rightful the taking of property or the injury of property in New Jersey. In other words, one is not at liberty to injure another merely by showing an ability and willingness to pay damages." (R. 4771; Rep. 23.) The cases cited by the Special Master on page 23 and 24, show that statutory authority conferred by the defendant state upon the defendant city cannot operate to produce any extra-territorial benefit or effect. (R. 4771.)

With the conclusions referred to in the last two preceding paragraphs we are in entire accord, but by his finding that by reducing the amount of the proposed diversion to 440 million gallons daily all substantial damage to plaintiff and its citizens will be removed (pp. 206, 207), the Special Master determines a question of fact which, if accepted by the court amounts to *res adjudicata* without trial or hearing.

Under the heading "A question of degree" (pp. 35-37), the Special Master discusses the extent to which the diminution of the flow of a stream was permissible to a riparian owner under the common law. The authorities cited have no application whatever to a taking for a municipal water supply. Bearing in mind that the common law rule involves no right of possession of the waters as property "for water is a moving, wandering thing and must of necessity continue, by the law of nature; so that I can only have a temporary transient, usufructory property therein." *II Bl. Com. 18.*, the proprietary right is confined to the use of the water while it runs over the lands of the riparian proprietor, as an incident to the land. He cannot unreasonable detain it or give it another direction, and he must return it to its ordinary channel when it leaves his estate. (3 *Kent's Com.* 537).

It is true that in all three states the right of municipalities along a stream to temporarily abstract water there-

from for municipal use has been recognized, but only by express legislative authority for that purpose. In all such cases (in one of which, *Sparks Mfg. Co.* v. *Newton*, 57 N. J. Eq. 367, the subject is extensively discussed), the municipality was located either upon the stream, as is the case with Phillipsburg, Trenton and Burlington in the present case, or at least within the watershed of the stream. In such cases a substantial amount of the water is returned to the stream after such use. None of the cases cited by the Special Master (and we believe none can be found, at least in the eastern states, which) authorize the diversion of water from a stream from one watershed for use as a municipal water supply at a distant place in another watershed. In all of the cases there existed a legitimate relation between the stream and the municipality. In the present case the defendant city has no legitimate interest whatever in the Delaware watershed or river. As will later appear, it has ample water resources in its own watershed. If in this case it was the State of New York that undertook to divert water from the Delaware tributaries within its boundaries some legitimate interest might appear, but the State of New York has no interest whatever in this water supply for New York City, except that as a part of its administrative law, a permissive act of approval by its Water Power and Control Commission is necessary before a municipality can develop and use a water supply from any source within the state. The party threatening this diversion is the defendant city which is located at least 80 miles from the nearest portion of the proposed diversion area and approximately 60 miles from the nearest point on the Delaware River, separated by the entire breadth of the State of New Jersey.

At page 33 of the report, the Special Master cites the case of *Wisconsin* v. *Illinois*, 278 U. S. 368, which did not in any way involve the question of the right of the City of Chicago to take water from Lake Michigan for municipal

water supply. He speculates (p. 34) as to what the court's decision would have been if that had been the question involved. It cannot be denied that Chicago was founded and has been developed in its present location because of the existence of Lake Michigan and the availability of its waters for domestic and other purposes. If New York City was located on the Delaware River, as is the City of Trenton, this suit would never have been instituted. It was because the defendant city had no legitimate interest in the water of the Delaware and because the plaintiff and its citizens have a legitimate interest in those waters which is threatened with invasion that this suit was authorized by the legislature of the plaintiff and instituted by its Attorney General.

The plaintiff submits that not only by virtue of the common law rule which has been followed in all three states since the beginning of their settlements, but also by the law of nature, it and its citizens are entitled to the reasonable use of the natural flow of the Delaware, not only for the legitimate requirements of the present, but also for the benefit of indefinite future economic and population growth. It does not ask a "monopoly" of the waters, as referred to by the Special Master (p. 36). It asks for that use which by law has belonged to it and its citizens from the beginning as their birth-right under the English common law, and has been confirmed to them by the constitution and laws of the plaintiff and the decisions of its courts to the present day.

The Special Master says: (p. 37):

> "The common law itself is not static but grows and expands to meet new conditions of society as they arise, and the same is true as to interstate common law."

We cannot conceive how "the common law itself" can grow and expand. We perceive how its application may be extended. While the application of the common law

itself may be extended, as from a stage coach to a railroad, nevertheless the law itself does not change and the rights thereunder remain the same. The law itself as it existed at the time, having been expressly adopted by the constitution of the states, cannot be changed except by legislative enactment, of which there is none in this case, and such changes are subject to the well-known rule that acts in derogation of the common law must be strictly construed.

Brown v. *Barry*, 3 Dal. 365; *Ransom* v. *Williams*, 2 Wall 313; *Ross* v. *Jones*, 22 Wall. 576; *Nudd* v. *Burrows*, 91 U. S. 426.

In *Mangles* v. *Freeholders*, 55 N. J. L. 88, 91, the New Jersey Supreme Court said:

> "It is the duty of the court to maintain the law as it stood at the adoption of the constitution, but not to extend its operation."

Notwithstanding the finding that the common law rule respecting the right to flowing waters is in force in all three states, the Special Master reaches the following conclusions:

> "I am, therefore, of the opinion that this case is not to be decided according to the common law of New Jersey, New York or Pennsylvania, but in accordance with interstate common law as determined by this court." (P. 28).
>
> "While I find no decision of this court directly and absolutely controlling in the present controversy, yet I am of the opinion that the principles decided by this court in the cases above mentioned sustain the view that New York City is entitled to divert a reasonable quantity of water from the tributaries of the Delaware * * *.
>
> Bearing in mind that the common law permits a reasonable diminution in the flow of a stream by an upper proprietor; that all three states have permitted diversions (in some instances from one watershed to another) for canal and other purposes; that this court in controversies between states applies "federal law,

state law and international law *as the exigencies of the particular case may demand*"; that interstate common law, as far as developed by this court permits reasonable diversions and even from one watershed to another in some instances, I am brought to the conclusion that the only decision, consonant with right and justice, is to hold that a reasonable diversion by New York City should not be enjoined and that the doctrine of equitable apportionment of the waters of an interstate stream is a sound principle of interstate common law." (pp. 37, 38).

Without stating, or citing, any or which of the laws he applied, or found applicable to this case, he says that this court applies to controversies between states "federal law, state law, and international law, as the exigencies of the particular case may demand," (R. 4785; Rep. 37).

We respectfully submit that there is no federal law applicable to the situation. The Master concedes that the state law, of each of the three states, is the common law rule of riparian rights. It is submitted that international law affords no authority or justification for his conclusion. *(1 Moore's Int. L. Dig. 653).* He rests his decision upon what he terms "interstate common law." That term is undefined in our books. There is and can be no common law of the United States. *Wheaton* v. *Peters,* 8 Peters. 591, 658. In that case Mr. Justice McLean in delivering the opinion of this court said:

(p. 658) "The federal government is composed of twenty-four sovereign and independent States, each of which may have its local usages, customs and common law. There is no principle which pervades the Union and has the authority of law that is not embodied in the Constitution or laws of the Union. The common law could be made a part of our federal system only by legislative adoption.

When, therefore, a common law right is asserted, we must look to the State in which the controversy originated."

The common law rule of decision in the Federal Courts is that of the state in which the court is sitting. *(2 McLean 568)*. Common Law is defined by Blackstone as the monuments and evidences of legal custom which he styles *leges non scriptae* "because their original institution and authority are not set down in writing, as acts of parliament are, but they receive their binding power, and the force of laws, by long and immemorial usage, and by their universal reception throughout the kingdom." *1 Bl. (Introduction) 64.* This definition, stated differently and somewhat enlarged, is given by Chancellor Kent in *1 Kent's Com. 471.*

Since the essential qualities of the common law are not only immemorial usage, but also the common consent of the subject, we respectfully submit that there is no established rule of interstate common law in this country.

When the doctrine is the same in the three states, state lines disappear for the purposes of a decision and there appears what might truly be termed an interstate common law, that is, a law common to the three states. This was the situation existing in *Wyoming* v. *Colorado,* 259 U. S. 419, where neither state undertook to impose upon the other a doctrine or policy different from that of the other state's own choosing, but there existed what Mr. Justice Van Dervanter called a "common policy which each enforced within their limits" (p. 465).

In interpreting the decision in *Kansas* v. *Colorado,* 206 U. S. 46; Justice Van Dervanter also called attention to the fact that that decision was predicated upon particular facts disclosed "and the local law of the two states" (p. 664), as were the decisions in *Wyoming* v. *Colorado* and *Wisconsin* v. *Illinois* (infra).

We adopt and apply the language of the Attorney-General of the defendant state from his argument in *Wisconsin* v. *Illinois*, 278 U. S. 367, 371.

> "That State of New York has the right for itself and in behalf of its citizens to insist that the waters of the Great Lakes-St. Lawrence Waterway flow down to it without dimunition by the defendants, under the common law and under the law of riparian rights as it exists in the State of Illinois and in the State of New York.
>
> The acts of the defendants constitute an illegal use of the waters of a natural watercourse, actionable under the law of Illinois or the law of New York. New York asks the Court to apply the same rule that the Illinois courts would apply in a similar matter properly before them."

This accords not only with the literal meaning of the word "common" but also with the definition of common law, to be found in the authorities:

1 *Blackstone Commentaries*, page 64; (Intro.)
1 *Kent's Commentaries*, 471, 472;
3 *So. Cal. Law Review* (December, 1929), 84, 96.

Differences between the Common Law Rule and the Appropriation Rule.

In view of the diametrically opposite principles involved in the rule of appropriation as compared with the common law rule of riparian rights, it is difficult to understand how any common law, interstate or otherwise, could be derived from decisions under the appropriation rule which could be applied under the common law rule, or vice-versa, without doing violence to the very essence of one or the other of these rules. They spring from irreconcilably different social and economic conditions.

The common law was born of an ancient social order where there existed, as in the eastern states of this country, humid conditions which provided a rain-fall and atmos-

pheric moisture generally sufficient for agricultural purposes and the value of running water lay chiefly in the force of its motion. It was brought to this country by the colonists and remained here until it was expressly adopted by the constitutional or legislative act of all the original thirteen states. It was also adopted by all of the new states admitted during the first three-quarters of a century of the history of the nation, and by many of them admitted since that time.

Under the common law, title to the riparian lands was necessary to give rights in a flowing stream. Every riparian proprietor had the right to use the water of the stream as an incident to the ownership of his land and that right existed whether he exercised it or not and he might begin to exercise it whenever he chose. The right never depended upon the use made of it, and no prior occupation or use by an upper riparian owner could affect it. Each riparian proprietor had an equal right to the use of the entire flow, and he was entitled to the continued natural flow of the stream without diminution in quantity or quality, except such as might result from the reasonable use of the water by upper riparian owners.

The fundamental principle of the common law rule was that the riparian owner had no right of possession or property in the water itself, He had only a usufructuary use of the water as it passed along. *"Aqua currit, et currere debet, ut currebat."* No one could divide up the water and say "this portion is mine." It was an indivisible thing, like air and sunlight, passing as a whole, undiminished in quantity and therefore equally serviceable to every successive riparian owner.

This equality of use of the undivided volume of the flow existed *jure naturae* (*Gould on Waters, Section 227, p. 449*).

The appropriation rule (sometimes called "The Priority System") has an entirely different background from that of the common law rule.

Until gold was discovered on the Pacific Coast, followed by the arrival of miners from the states, the arid regions of the west, except for isolated settlements, constituted a sort of "no man's land" which was ceded to the United States by Mexico at the end of the Mexican War and thereafter constituted a public domain in which no titles had been confirmed or granted. Out of the necessities of mining and agriculture under irrigation the property in water was treated the same as the property in land, and the water, with or without the land, was "appropriated" by the settlers to their own sole and exclusive use to the extent that either was necessary for their purposes. This custom was accepted by the courts and by the legislatures when those regions came into statehood and Congress later made provision for confirming titles to land in the public domain on the basis of that custom. *Jennison* v. *Kirk, 98 U. S. 453.*. The origin and nature of the appropriation rule is considered also in *Broder* v. *Natoma Water & M. Co. 101 U. S. 274; Meng* v. *Coffey, 60 L. R. A. 910; 67 Neb. 500, Farnham, Waters and Water Rights, Vol. 3, p. 2017, et seq.; Gould on Waters; Secs. 228-240, pp. 451-476.*

The appropriation rule was a sort of "border law" that arose entirely out of the necessities and conveniences of the pioneer settlers. The rule is described as follows:

> "The fundamental principle of the appropriation system is that the water user who first puts to beneficial use—irrigation, mining, manufacturing, power, household or other economic use—the water of a stream, acquires thereby the first right to the water, to the extent reasonably necessary to his use, and that he who is the second to put the water of the stream to beneficial use acquires the second right, a right similar to the first right but subordinate thereto, and he who is the third to put it to use acquires the third

right, a right subordinate to the other two, and so on throughout the entire series of uses. The right thus created by user is called an appropriation, and the place of use may be on lands whether riparian or non-riparian, whereas under the riparian system of water rights the place of use must be on lands which are riparian." Citing *Atchison* v. *Peterson*, 20 Wall. 507; *Jennison* v. *Kirk*, 98 U. S. 453. (*36 Harvard Law Review, June, 1923*, p. 961.).

It was not even recognized as a system of law until after the middle of the last century. In 1867 it was recognized by Congress as an existing custom in certain parts of the public domain of the west. 14 *Stat. L.* 253. But in 1869 it had not yet been sufficiently established as a rule of law to receive notice by Mr. Angell in his famous treatise, "The Law of Water Courses" published in that year.

What appears to have been the first case in this court involving that rule was *Atchison* v. *Peterson* (87 U. S. 507) decided in 1874. The case arose in Montana Territory but the court had to go to the decisions of the California courts for its precedents. In that case the court defines the common law rule and then proceeds to explain the peculiar conditions of climate and soil which render it inapplicable to the territory in question. It says:

"But the government being the sole proprietor of all the public lands, whether bordering on streams or otherwise, there was no occasion for the application of the common law doctrine of riparian proprietorship with respect to the waters of those streams."

Users under the appropriation rule had no thought of returning the water to the stream. It was impossible to do so. Among the facts stated by Chief Justice Fuller in *Kansas* v. *Colorado*, 185 U. S. 125, 128, the following appears:

"Owing to the dryness of the climate, the cloudlessness of the sky, the high elevation, and the prevailing winds, evaporation is rapid and great, being about 60 inches per annum at the east end of the

river valley in Kansas, and 90 inches at the west line of the state."

Three hundred tons of water is required to produce one ton of dry plant substance. (R. 2028). The absorption by evaporation and vegetation left little, if any, water to find its way back into the bed of the stream, even if, as frequently occurred, the diversion was not entirely away from the watershed. A vast quantity of water is necessary for irrigation, particularly in dry climate and porous soils. For this reason the use of water for irrigation was considered in England as an artificial rather than a natural or primary use of waters of a stream. *Angell, on Watercourses.* (6th Ed.) p. 217. The *permanent* abstraction of water from the stream is an essential element of the appropriation rule, and therefore the question of an equitable apportionment of waters is always an essential and indispensible element in determining the rights of parties thereunder.

It was for this reason that this court held in *Kansas* v. *Colorado*, 206 U. S. (p. 104):

> "As Kansas thus recognizes the right of appropriating the waters of a stream for the purposes of irrigation, subject to the condition of an equitable division between the riparian proprietors, she cannot complain if the same rule is administered between herself and a sister state."

It said that the waters "are, except for domestic purposes, practically useful only for the purposes of irrigation." (p. 105). "There are substantially no falls, no narrow passage-ways, in which dams can readily be constructed for the development of water power." (p. 105).

> "The appropriation, or as it also is called, the priority system of water rights, prevails either exclusively or to a partial extent in seventeen of our states: Arizona, Colorado, Idaho, Nevada, New Mexico, Utah, Wyoming, California, Montana, North Dakota, South Dakota, Kansas, Nebraska, Oregon,

Oklahoma, Texas, and Washington. In the seven first named the appropriation system is exclusive." *Harvard Law Review,* Vol. 36 (June, 1923) p. 961.

The common law rule applies in the remaining thirty-one states, including those of the Mississippi valley. *Kincaid* v. *United States,* 35 Fed. (2d) 235; 37 Fed. (2d) 602, (1929).

From the above comparison it will appear that the common law rule and the appropriation rule have absolutely nothing in common. That they are entirely antagonistic to each other in their origin and application. They could not possibly co-exist in the same region and under the same conditions. Under the theory of the common law rule an equitable apportionment of the waters of a stream would be impossible; under the appropriation rule, it is indispensible. In no case has the court undertaken to originate an equitable apportionment of waters, even in the states where the appropriation rule applies. In *Wyoming* v. *Colorado* (supra) it ascertained the existing priorities of use as between the two states and based its decision thereon to the extent that that decision amounted to an equitable apportionment of waters. It merely adopted the apportionment which prior diversions had established.

The effect of the Special Master's conclusion is to apply the minority rule of appropriation, heretofore applied only to peculiar conditions of climate and soil, to states in the majority group, where those peculiar conditions never existed, and which have never recognized any but the majority rule of riparian rights.

In the present case, as Mr. Justice Holmes stated in *Hudson County Water Co.* v. *McCarter,* 209 U. S. 349, 356. "The problems of irrigation have no place here."

Cassante ratione legis cassat et ipsa lex.

The decisions.

There have been four decisions of this court involving the diversion of waters from interstate streams.

Kansas v. *Colorado.*

The first case is *Kansas* v. *Colorado,* originally considered on the pleadings, alone, in 185 U. S. 125, and later on the merits in 206 U. S. 46. Kansas sought to restrain diversions in Colorado of waters from the Arkansas River. The territory involved was an arid region in which the only practicable use of water was for land irrigation, without which the land was uninhabitable and unusable. These conditions were emphasized by the intervention of the United States for the development of public lands under the Federal Reclamation Act. The case involved no question of navigation, recreation, sanitation, fisheries, or water power, but solely the question of irrigation. At page 94 of the decision Mr. Justice Brewer discusses the common law rule of riparian rights as it existed in England and as it was adopted in this country in all of the states which formed the original Union. He points out, however, p. 95, that when the states of Kansas and Colorado were admitted to the Union, the latter adopted the rule of appropriation of flowing waters for the purpose of irrigation, mining, etc., which theretofore prevailed in the arid regions of the West.

It appeared that while Kansas had adopted generally the common law rule, which was applied throughout the eastern portions of the state, there were in its western part two and one-half million acres of land in the Arkansas river valley whose rain-fall was insufficient for agricultural purposes (185 U. S. 125, 127), and within that area the appropriation rule was applied. In fact Kansas claimed to be the prior appropriator on the Arkansas river (185 U. S. 125, 146). Consequently when the court

came to decide the case on the merits (206 U. S. 46, 100) it declared its purpose to—

> "So adjust the dispute upon the basis of equality of rights as to secure as far as possible to Colorado the benefits of irrigation without depriving Kansas of the *like beneficial effects* of a flowing stream." (Italics ours.)

(p. 102) "And here we must notice the local law of Kansas as declared by its supreme court, premising that the views expressed in this opinion are to be confined to a case in which the facts and the local law of the two states are as here disclosed."

(p. 104) After reviewing the decisions of the Kansas Courts, this court said:

> "As Kansas thus recognizes the right of appropriating the waters of a stream for the purpose of irrigation, subject to the condition of an equitable division between the riparian proprietors, she cannot complain if the same rule is administered between herself and a sister state."

(p. 105) "The drainage area of the Arkansas river in Colorado is 26,000 square miles; in Kansas 20,000 square miles; and all this area, unless the stream can be used for purposes of irrigation, would be left to the slow development which comes from the cultivation of the soil."

The average annual flow of the Arkansas river as it emerges from the Royal gorge was found to be 750 cubic feet per second (p. 104). Let it be noted that the proposed diversion involved in the present case is 928 cubic feet per second (R. 4804; Rep. p. 54). The court reviewed (p. 106) the results of irrigation in Colorado from 1884 to 1900 in increases in population, cultivated areas and value of farm products, and held that before this effective cause of development was destroyed or materially interfered with, it should be clear that Kansas had not merely some technical right but also a right with corresponding benefit.

With respect to the contention of Kansas for the application of the common law rule, although itself recognizing the appropriation rule within its own territory, the court refused to apply to Colorado a rule different from its own. It therefore applied the appropriation rule, which Kansas recognized. On the question of equality of the states and their independence of each other in matters of state legislation, the court said:—

> (p. 95) "Neither state can legislate for, or impose its own policy upon the other."
>
> (p. 97) "One cardinal rule, underlying all of the relations of the states to each other, is that of equality of right. Each state stands on the same level with all the rest. It can impose its own legislation on no one of the others, and is bound to yield its own views to none."

(p. 117) Summing up its conclusions the court found that the diversion of waters in Colorado for irrigation had diminished the flow of water in Kansas; that as the result of that appropriation large areas had been reclaimed in Colorado transforming thousands of acres into fertile farms and rendering possible their occupation and cultivation when otherwise they would have continued barren and unoccupied; that while this diminished flow had caused perceptible injury to portions of the valley in Kansas closest to the Colorado line, yet to the great body of the valley it had worked little if any detriment, and regarding the interest of both states, *and the right of each to receive the benefit of irrigation,* the court stated that it was not satisfied that Kansas had made out a case entitling it to a decree.

Wyoming v. *Colorado.*

The second case was *Wyoming* v. *Colorado,* 259 U. S. 419. Opinion by Mr. Justice Van Devanter. Wyoming brought suit against Colorado to restrain a proposed diversion of water from the Laramie River. The case was

thrice argued; once by direction of the court because of the novelty and importance of some of the questions involved.

(p. 456). The river flows for 27 miles in Colorado and 150 miles in Wyoming.

> (p. 456) "Both Colorado and Wyoming are in the arid region where flowing waters are, and long have been, commonly diverted from their natural channels and used in irrigating the soil and making it productive. For many years some of the waters of the Laramie river have been subjected to such diversion and use, part in Colorado and part in Wyoming."

The suit was brought to restrain an increase in the diversion and the proposed conduct of the water into another watershed lying wholly within Colorado for the use of irrigating lands more than fifty miles distant from the point of diversion, from which none of the waters could return to the stream or ever reach Wyoming.

(p. 457). Wyoming claimed prior diversions and therefore rights superior to those in Colorado. Colorado claimed an equitable division of the waters.

(p. 458). The court found that both states have vast plains and many valleys where there is insufficient natural precipitation for natural productiveness but with the aid of artificial water supply such areas would become fruitful. Before Colorado and Wyoming became states their territories were both included in the public domain of the United States. The court found from the decisions of the courts of last resort in both states

> "that the same doctrine respecting the diversion and use of the waters of the natural streams had prevailed in both from the beginning, and that each state attributes much of her development and prosperity to the practical operation of this doctrine;"

that

> (p. 459) "The common law rule respecting riparian rights in flowing waters never obtained in either

state. It always was deemed inapplicable to their situation and climatic conditions. The earliest settlers gave effect to a different rule whereby the waters of the streams were regarded as open to appropriation for irrigation, mining, and other beneficial purposes. The diversion from the stream and the application of the water to a beneficial purpose constituted an appropriation, and the appropriator was treated as acquiring a continuing right to divert and use the water to the extent of his appropriation, but not beyond what was reasonably required and actually used. This was deemed a property right, and dealt with and respected accordingly. As between different appropriations from the same stream, the one first in time was deemed superior in right, and a completed appropriation was regarded as effective from the time the purpose to make it was definitely formed and actual work thereon was begun, provided the work was carried to completion with reasonable diligence. This doctrine of appropriation, prompted by necessity and formulated by custom, received early legislative recognition in both territories and was enforced in their courts. When the states were admitted into the Union, it received further sanction in their constitutions and statutes, and their courts have been uniformly enforcing it."

(p. 460) The court then reviews federal legislation sanctioning this doctrine; the case of *Atchinson* v. *Peterson,* in which the equality of the right of riparian proprietors under that doctrine was discussed; the case of *Broder* v. *Natoma Water and Min. Co.* (supra), wherein it was held:

(p. 461) " * * * such artificial use of the water was an absolute necessity" * * *;

and (p. 462) the case of *United States* v. *Rio Grande D & I Co.,* 174 U. S. 690, which held that the appropriation rule was—

* * * "in contravention of the common-law rule as to continuous flow"; * * *

(p. 464) The case of *Kansas* v. *Colorado* is referred to as "a pioneer in its field" and the court quotes therefrom—

"'The' views expressed in this opinion are to be confined to a case in which the facts and the local law of the two states are as here disclosed.' "

* * * * * * * * * *

"As respects the scope and interpretation of the ultimate conclusion in that case it should be observed, first, that the Court was there concerned, as it said, with a controversy between two states, 'one recognizing generally the common-law rule of riparian rights' and the other the doctrine of appropriation; secondly, that the diversion complained of was not to a watershed from which none of the water could find its way into the complaining state, but quite to the contrary; and, thirdly, that what the complaining state was seeking was not to prevent a proposed diversion for the benefit of lands as yet unreclaimed, but to interfere with a diversion which had been practiced for years, and under which many thousands of acres of unoccupied and barren lands had been reclaimed and made productive. In these circumstances, * * * the Court said: 'it would seem equality of right and equity between the two states forbids any interference with the present withdrawal of water in Colorado for purposes of irrigation'; * * * What was there said about 'equality of right' refers, as the opinion shows (p. 97), not to an equal division of the water, but to the equal level or plane on which all the states stand, in point of power and right, under our constitutional system.

Like that case, the one now before us presents a controversy over the waters of an interstate stream. But here the controversy is between states in both of which the doctrine of appropriation has prevailed from the time of the first settlements, always has been applied in the same way, and has been recognized and sanctioned by the United States, the owner of the public lands. Here the complaining state is not seeking to impose a policy of her choosing on the other state, but to have the common policy which each enforces within her limits applied in determining

their relative rights in the interstate stream. . . . And here the complaining state is not seeking to interfere with a diversion which has long been practiced and under which much reclamation has been effected, but to prevent a proposed diversion for the benefit of lands as yet unreclaimed."

(p. 466) The court refused to sustain the objection of Wyoming to the diversion from one watershed to another because

> "In neither state does the right of appropriation depend on the place of use being within the same watershed. Diversions from one watershed to another are commonly made in both states, and the practice is recognized by the decisions of their courts."

(p. 467) The court then considered whether the doctrine of appropriation, which each state recognized and enforced within its boundaries, should be applied.

> "The lands in both states are naturally arid, and the need for irrigation is the same in one as in the other. The lands were settled under the same public land laws, and their settlement was induced largely by the prevailing right to divert and use water for irrigation, without which the lands were of little value."

The development of the country is then described, including first the irrigation of lands adjacent to the streams and later of lands remote therefrom, and the construction of impounding reservoirs to provide additional flow during the seasons when the natural flow was insufficient.

(p. 468) Beginning in territorial days and continuing after statehood, the appropriation rule constituted the foundation of all rural home building and agricultural development. If these rights were now rejected the lands would return to their natural arid condition. The appropriation began as much as fifty years before that case was decided (1921).

> "Thus the interests of the state (Wyoming) are indissolubly linked with the rights of the appropria-

tors. To the extent of the appropriation and use of water in Colorado a like situation exists there."

(p. 470) The court concludes that the doctrine of appropriation furnishes the only basis of decision consonant with the principles of right and equity applicable to such a controversy.

"The cardinal rule of the doctrine is that priority of appropriation gives superiority of right. Each of these states applies and enforces this rule in her own territory, and it is the one to which intending appropriators naturally would turn for guidance." * * *

"These considerations persuade us that its application to such a controversy as is here presented cannot be other than eminently just and equitable to all concerned."

Suits between individuals of defendant states involving the same common rule of appropriation are reviewed (p. 471) and applied in support of the court's conclusion.

(p. 472) After an extensive review of the testimony the court determined the available supply and the extent of the prior appropriations in the two states in the order of their respective priorities and from that determination it undertook (p. 496) to apportion the available supply according to the senior appropriations in Wyoming and the junior appropriations in Colorado.

Wisconsin v. *Illinois.*

The third case was *Wisconsin* v. *Illinois* (278 U. S. 367), with which was combined the companion suits of *Michigan* v. *Illinois* and *New York* v. *Illinois.* That suit was for an injunction to restrain the Chicago Sanitary District from diverting, under authority of the State of Illinois, water from Lake Michigan for the purpose of sewage disposal through the Chicago drainage canal into the Mississippi valley. Originally the War Department had issued a permit for the diversion of a small amount

of water from Lake Michigan into the canal for the purposes of navigation. Later the city of Chicago obtained permits from the War Department for a diversion up to 8,500 cubic feet; the increase being solely for the sanitary purposes mentioned. The contentions of the complaining states were—that the power of the Federal government to authorize diversions of water was limited to the purposes of navigation and that this authority did not extend to the diversion of water from one watershed to another; second, that the transfer violated the constitutional provision against a preference of the ports of one state over those of another; and third, that the diversion deprived complainant states and their citizens of property without due process of law and of the natural advantages of their positions, contrary to their sovereign rights as members of the Union.

In delivering the opinion of this court, the late Chief Justice Taft said (p. 409)

> "If one of these issues is decided in favor of the complaining states, it ends the case in their favor and the diversion must be enjoined."
>
> * * * * * * * * * *
>
> (p. 418) "It may be that some flow from the lake is necessary to keep up navigation in the Chicago river, which really is part of the port of Chicago, but that amount is negligible as compared with 8,500 second feet now being diverted. Hence, beyond that negligible quantity, the validity of the Secretary's permit derives its support entirely from a situation produced by the sanitary district in violation of complainant's rights; and but for that support complainants might properly press for an immediate shutting down by injunction of the diversion, save any small part needed to maintain navigation in the river. In these circumstances we think they are entitled to a decree which will be effective in bringing that violation and the unwarranted part of the diversion to an end."

In the Chicago case all of the complaining states, as well as the state of Illinois, had adopted and followed the common law rule of riparian rights and the complaining states rested their claim to an injunction upon the common law rule. New York State contended that the common law rule imposed upon the states an obligation which rendered

> "* * * improper the tolerance of any diversion productive of such an effect even though it should occur at a point where the river ceased to be navigable and lay wholly within the domain of the acquiescent territorial sovereign. An international stream must be considered as a unity rather than from the viewpoint of the selfish needs of a particular State seeking to divert its waters.
>
> 'Where a river traverses or serves as the boundary of territories of several States, the existence of the river interest, as such, becomes the more apparent, because of the common concern of all in its welfare.'
>
> * * * * * * * * *
>
> "The rule that a State may not divert the waters of a natural watercourse to the injury of a downstream State or its citizens has been applied by this Court in interstate controveries where even the great consideration of navigation was lacking.
>
> The State of New York is the owner of the lands under the waters of Lakes Erie and Ontario and the Niagara and St. Lawrence Rivers within its limits. It has a property interest in the running water naturally flowing to such lands and its shores on the lakes and rivers of the Great Lakes—St. Lawrence Waterway. When such running water is withheld and permanently diverted into the Mississippi Watershed, the property of the State of New York is taken, and it is entitled to an injunction. Such a withholding of the running water as the acts of the defendants have caused, violates the rights of the State and its citizens guaranteed by the Constitution" (pp. 372, 373).

Counsel for the State of New York pointed out that neither State may part with its lands under water to

such an extent that the right of present, or the opportunity of improving future, navigation is impaired. Citing *Long Sault Development Co.*, 212 N. Y. 1; 242 U. S. 272 (p. 375).

He said:—

> "New York asks the court to apply the same rule that the Illinois courts would apply in a similar matter properly before them" (p. 371).

That is precisely the "common policy" which the court referred to and applied in *Wyoming* v. *Colorado*, 259 U. S. 419, 465, and it followed the same course in the Chicago case, by granting complainant's prayer for injunction.

On the argument before Special Master Hughes, on rereference, the Attorney General of New York State, who represented that defendant in our case, argued that, in principle, there was no difference between the facts in the Chicago case and those in a supposed case where one person diverted water from a stream to the damage of a lower riparian owner, and he urged a decree on that basis (*Oral argument, Wisconsin* v. *Illinois, October 3, 1929, stenographer's minutes*, pp. 312, 313).

Connecticut v. *Massachusetts.*

The fourth case involving the diversion of interstate waters is *Connecticut* v. *Massachusetts*, decided February 24, 1931, (9 Adv. Op. 297, 1930 Term). Plaintiff sought to enjoin the diversion of waters from the Ware and Swift rivers, tributaries of the Connecticut river in that watershed, to another watershed, for water supply for the Metropolitan District of Boston.

While those steams were located, and the diversion was proposed, within the State of Massachusetts, the waters involved flowed naturally to the State of Connecticut. The Secretary of War indicated his lack of objection to the proposed diversion if limited and regulated according to

the conditions he imposed, which the State of Massachusetts expressed its willingness to accept. The Special Master found that the proposed diversion area was 2.93% of the total watershed area above the Connecticut line and that the amount of diversion contemplated amounted to 2% of the average annual flow at the state line (p. 300).

Various elements of damage to plaintiff and its citizens were claimed in the complaint and in the testimony. Plaintiff suggested alternative sources of supply which it alleged were available to the defendant without injury to the plaintiff or its citizens. These sources were considered, and found to be both unsuitable and inadequate. This conclusion was not based upon any question of mere convenience or cost economies (p. 301).

The court decided that the plaintiff had failed to sustain its burden of proof of any substantial damage. Plaintiff contended that the common law rule of riparian rights prevailed in both states and that it was entitled to the application of that rule. The court recognized the right of each state "to change its laws governing riparian ownership and to permit the appropriation of flowing waters for such purposes as it may deem wise" (p. 302).

As a matter of fact the common law rule of riparian rights has been generally applied and followed in both Connecticut and Massachusetts from the beginning of their settlements. But, by acts of the legislature of the latter state, enacted in 1926 and 1927, it modified that rule by expressly authorizing the Metropolitan District to impound and divert to the City of Boston and vicinity certain waters of the Ware and Swift Rivers which were the precise waters involved in the case (p. 298).

The right of a state to modify, by legislature act, its rules of property rights, be they common law or otherwise, being conceded, the situation presented to the court in the Connecticut case was that of two states having different rules

applicable to the *res gestae*. Being unable to find a "common policy which each (state) enforces within her own limits," as the court had found in each of the three cases heretofore reviewed, it returned to its previous doctrine of the "equal level," of the states and its refusal to enforce upon one state against its will and contrary to its own, the rule of another state, and concluded "that, upon a consideration of the pertinent law of the contending states and all other relevant facts, this court would determine what is an equitable apportionment of the use of such waters" (p. 303).

After reviewing the case of *Kansas* v. *Colorado* where the property rights in flowing water were not exactly the same and where injury and benefits were balanced to determine the court's decision, and the case of *Wyoming* v *Colorado* where the rule of property rights in flowing water was the same in both states and the court merely applied that rule between them on the basis of existing priorities. The court concludes

> "It is very clear that, under earlier decisions here, the strict rule for which Connecticut contends are not necessarily controlling in this case. There is nothing in the master's findings of fact to justify an inference that any real or substantial injury or damage will presently result to Connecticut from the diversions by Massachusetts authorized by the Acts of 1926 and 1927 as limited and defined by the Secretary of War" (p. 303).

Summary.

As appears from this review, in the Kansas and Wyoming cases, the court considered only the conditions existing in the states under the common practice of the appropriation of waters for irrigation purposes and rested its decisions solely upon the fact that the appropriation rule was common to the states involved and therefore constituted "the common policy which each enforces within her own

limits." To the extent that these decisions contribute to the development of a system of "interstate common law," they must be "confined to a case in which the facts and the local law of the two states are as here disclosed." There is nothing in either case which justifies the application of any rule of "equitable apportionment" of waters among states where the common law rule is applied.

In the Chicago case, where all of the parties followed the common law rule, the doctrine of equitable apportionment was not considered as having any application to the case. The court decided the case in strict accordance with the rights of the complaining states as riparian owners under the common law rule.

Up to this point the development of what might be termed a system of "interstate common law" was limited to the application in controversies *between* states of the rule recognized *within* each of those states, or what the court called the "common policy" thereof.

In the Kansas and Wyoming cases that "common policy" happened to be the appropriation rule, involving the indispensable doctrine of equitable apportionment on the basis of rights established under that rule. In the Chicago case that "common policy" happened to be the common law rule, involving no doctrine of equitable apportionment. It is therefore a mistake to assume that the so-called system of the interstate common law developed by the decisions of this court, necessarily involves the doctrine of equitable apportionment.

In the Connecticut case, there being no "common policy," the court was required to take one step in advance of those necessary in the three preceding cases. It did not, however, undertake to decree an equitable apportionment of waters, or even that the proposed diversion amounted thereto. It dismissed the bill because Connecticut had not shown itself entitled to injunctive relief.

This court has always regarded original actions between states as *sui generis* and in each of the cases herein previously reviewed the court has, either by express statement or in effect, confined its conclusions to "the facts and local laws" of the states involved. *Kansas* v. *Colorado*, 206 U. S. 46, 102; *Wyoming* v. *Colorado*, 259 U. S. 419, 464; *Wisconsin* v. *Illinois*, 278 U. S. 367, 271.

Comparison of Cases.

The case *sub judice*, in point of either fact or local law, has nothing in common with *Kansas* v. *Colorado*, or *Wyoming* v. *Colorado*. In point of fact (substantial damage being found) and in point of local law (a common law rule applicable in all states involved), this case is like that of *Wisconsin* v. *Illinois*.

This case differs from the Connecticut case in several important respects:

(a) There, the diversion was limited to "flood waters" on the Ware River in excess of 85 m. g. d. and all waters on the Swift River in excess of 20 m. g. d. between October 15th and June 15th of each year, amounting to a total diversion at the rate of 191 m. g. d, or approximately 80 billion gallons per year; here the proposed diversion would apply throughout the year at the rate of 600 m. g. d. or 219 billion gallons per year.

(b) There, the diversion area was 2.93% of the watershed above the Connecticut State line and the diversion amounted to 2% of the average annual flow; here, the proposed diversion area is 17.8% of the watershed above the New Jersey State line (R. 4807; Rep. 57) and the proposed diversion amounts, to from 14.6% to 16%, of the total annual average flow at the New Jersey State line (R. 4825; Rep. 74).

(c) There, the common law rule applied exclusively in Connecticut and generally in Massachusetts except that the latter had by legislative acts adopted the appropriation rule with respect to the particular streams involved; here, the common law rule applies, without pertinent modification, uniformly in the three states involved.

(d) There, no real or substantial damage or injury was shown; here, the Special Master found "substantial damage and, in my opinion, more than New Jersey should be expected to bear * * *" (R. 4953; Rep. 193).

(e) There, the court found that the additional water supply could not be obtained from suitable or adequate sources within the natural watershed of the Metropolitan District, the protection of which was within the defendant's control; here, the necessary additional water supply can be obtained from suitable and adequate sources within the natural watershed of the defendant city, the protection of which is within the entire control of the defendant state.

(f) There, defendant's proposed diversion had the approval of the War Department; here, no such approval has been given, or applied for.

Special Master's Modification.

Because of his finding of substantial damage resulting from the proposed diversion of 600 million gallons per day the Special Master states that this damage can be removed by the reduction of the amount of the proposed diversion to 440 million gallons a day, with a modified form of release and the treatment of sewage and trade waste above the New Jersey State line (R. 4966; Rep. 206, pars. 40-42). This recommendation will be considered under Point VII of this brief.

The Proposed Compacts.

Plaintiff's Exception No. 2 (R. 4980; Rep. 39) deals with the admission in evidence of two proposed compacts between the states of New Jersey, Pennsylvania and New York, neither of which was ever ratified by New Jersey or Pennsylvania. They were offered by the defendant City and admitted over the objection of the plaintiff. One was a proposed compact dated January 24, 1925 (Exhibit 303) and another dated June 13, 1927 (Exhibit 304.) These compacts were negotiated by commissioners appointed by the several states to investigate the development and utilization of the water resources of the drainage basin of the Delaware River and to submit a comprehensive report recommending the policy that should be pursued for the best interest of such states, and the legislation, state and federal, which would be necessary to make such recommendations effective. (Chapter 94, N. J. Pamphlet Laws 1923, p. 180; Exhibit 315; Exhibits 3 and 4, pp. 95, 127, Chapter 154, N. Y. Laws, 1924, p. 97; Exhibits 2 and 3, p. 124, 127; Chapter 344, N. J. P. L. 1926, p. 783; Chapter J. R. 8, N. J. P. L. 1925, p. 706; Chapter J. R. 12, N. J. P. L. 1926, p. 801; Chapter 267, N. J. P. L. 1929, p. 631, 633; Pa. Laws, 1923, p. 448.)

The purposes of those negotiations included a comprehensive development of the resources of the Delaware river for hydro-electric power, municipal water supply, flood reduction, regulation of summer flows, etc. When these compacts were submitted to the respective legislatures, that of New York State, in each instance, immediately ratified, but the legislatures of New Jersey and Pennsylvania refused ratification because they dealt only with municipal water supply and neglected all of the other subjects of investigation. For the same reason the first compact was objected to by the United States War Department and by the Federal Power Commission, whose representative had participated in the negotiations. Exhibits

300-D, 300-Q and 300-H are reports to New Jersey municipalities or state boards, and state some of their objections to both of the proposed compacts. These two proposed compacts, upon the refusal of the legislatures of New Jersey and Pennsylvania to ratify them, become nonexistent from an evidential point of view. The Special Master states that he admitted them, not as documents binding on the parties, but as showing that the plan of the defendant City was not arbitrary, but had been adopted by the unaminous agreement of the commissioners (R. 4788; Rep. 39). A comparison of the defendant City's plan as outlined in Exhibit 4 with the second proposed compact (Exhibit 304) will show that the two are similar only with respect to the amounts of diversion and release, but that the New York Plan is totally different with respect to the reciprocal advantages contained in the proposed compact for the protection of the rights of the states and citizens of New Jersey and Pennsylvania. However, the Master's conclusions do not support the terms of either proposed compact.

The three states appointed their commissioners to conduct negotiations with a distinct understanding that they should report their conclusions to their respective legislators. When these reports were submitted New York State was the only one to ratify. Obviously the conclusions of the commissioners were not binding upon the states that did not ratify, with regard either to the terms of the proposed compacts, or the adoption of the principle of an equitable apportionment of the water. If the court should reach a different conclusion it would be unsafe hereafter for any state or nation to undertake negotiations for a treaty, lest it be bound by the recommendations of the commissioners, without ratification. However there is only one way in which a treaty between states can be consummated, and that is by the ratification of all the states and the consent of Congress. *U. S. Constitution, Art. 1, Section X, par. 3; Kansas* v. *Colorado*, 206 U. S. 46, 100.

It was error to admit the proposed compacts in evidence for any purpose.

A Question of Policy.

New Jersey lies, like the plan of Esdraelon, between two great cities (New York and Philadelphia) which for two and a quarter centuries have waged across her territory their war for commercial supremacy. The constant increase in populations has intensified the problem of water supplies for all great cities and brought into consideration more distant sources. As the distance increases, interstate complications arise, particularly on account of the small area of some of the North Atlantic states.

In the present case New York City wants 600 million gallons per day and Philadelphia wants 750 million gallons per day, from the Delaware River tributaries; 1,350 m. g. d., or 495 billion gallons per year.

As time passes these demands of every city will become more insistent and expansive, and if the constantly recurring cases are dealt with, as proposed by the Special Master in this case, this Court will, sooner or later, find itself face to face with the fact that it is *legislating* for and operating a gigantic interstate commerce in municipal water supply.

If the states are not authorized by judicial fiat to invade the natural water resources of their neighbors, and the great cities are confined to their legitimate watersheds, the whole matter will be settled, as it should be, by either Federal legislation or interstate compact. After all the regulation of the economic welfare of our cities is a political and not a judicial question.

Plaintiff respectfully submits that whatever system of interstate common law may have been developed by the decisions of this court, it requires the decision of the case

according to the facts and the local laws found to exist in the states involved and that the doctrine of equitable apportionment of waters has no application except where the "common policy," or local laws of the states involved require the application of the appropriation rule, and that there is no system of interstate common law which requires, or permits, the application of the doctrine of equitable apportionment of waters between states in all of which the "common policy" of the common law rule of riparian rights applies.

Plaintiff respectfully submits that the Special Master erred in the conclusions of law stated in Exceptions 1 to 4 inclusive (R. 4980; Rep. 37-39, 200, 208) and in refusing or failing to adopt the conclusions of law submitted by the plaintiff in Exceptions 5 to 9 inclusive (R. 4981) for the following reasons:

(a) Under the common law relating to riparian rights in effect in all three states, an injunction to prevent the invasion of a legal right should have been granted;

(b) The evidence shows, and the Master found, that the plaintiff had sustained its burden of proof in establishing that the proposed diversion of 600 million gallons per day by the defendant city would cause substantial damage to the plaintiff and its citizens;

(c) The evidence shows that there is no necessity for the proposed diversion (as will appear under Point II).

II.

Necessity for Diversion.

There is no necessity for the proposed diversion; at most it is merely a matter of convenience which is insufficient to justify a diversion from a foreign watershed in which other states have natural rights that would be substantially damaged thereby.

In its Fifth Defense the defendant City sets up the facts relating to its permanent and transient population and the rapid and continuous growth thereof, its great importance because of the amount of taxes paid by it to the nation, and the necessity of proceeding forthwith to make provision of future water supply (R. 4564).

Without questioning the importance of the City of New York in so far as relates to population and taxes, mere magnitude of interest cannot change the legal rights of the parties.

As was said in *Sanitary District* v. *United States*, 266 U. S. 405:

> "This brief summary of the pleadings is enough to show the gravity and importance of the case. It concerns the expenditure of great sums and the welfare of millions of men. But cost and importance, while they add to the solemnity of our duty, do not increase the difficulty of decision except as they induce argument upon matters that, with less mighty interests, no one would venture to dispute."

We submit that this defense is immaterial to the fundamental issues in the case. But assuming that the court will give consideration to the alleged "necessity" to use the tributaries of the Delaware, we urge that the City should be required to exhaust every reasonable means of supplying its needs from other sources before adopting a source which will cause injury to others.

There are such other sources within the territorial limits of the State of New York—so abundant that the proof

shows that without any trespass on any of its neighboring states, the City of New York may obtain a water supply from such sources for at least one hundred years (R. 2268).

We quote from the Master's Report, as follows:

> "It is also contended in the bill, and there is much proof to support this contention, that the city should exhaust its sources of water supply within the Hudson River watershed and on Long Island before resorting to the diversion of water from Delaware River, and there has been much proof on the part of the plaintiff and the defendants as to the relative cost of obtaining water from the Delaware River as compared to the cost of obtaining water from the Hudson River direct at or near Poughkeepsie, New York, or from what is called East Hudson Project No. 1, East Hudson Project No. 2, the Lower Schoharie watershed, or from the ground waters of Long Island.
>
> "The proof undoubtedly shows that the City of New York can obtain an additional water supply (equivalent in quantity to that which it proposed to take from the Delaware River tributaries), from tributaries of the Hudson River or from the Hudson River direct. In other words, it is undoubtedly possible for the City of New York to obtain the additional quantity of water which it desires without resorting to the Delaware River tributaries." (Rep. p. 44; R. 4793.)

The Master then concluded that as these other sources of supply might be more expensive or more polluted than the supply from the Delaware River tributaries, the State and City of New York "have not selected the tributaries of the Delaware River arbitrarily and without reason" (Rep. p. 45; R. 4794).

He then pointed out that before the City was allowed by the State to resort to the Delaware tributaries, there was a hearing before the Water Power and Control Commission of the State of New York, and that as a result of this hearing, resort was permitted to the Delaware River (Rep. p. 45; R. 4794).

We submit that the Master's conclusion overlooks several important facts.

In the first place, no notice of the hearing before the Commission of the State of New York was given to the plaintiff or to any of its officers; and, hence, the mere fact that the State of New York gave the City of New York a hearing is of no importance so far as the plaintiff is concerned.

In the next place, the Master seems to have overlooked the fact that on the question of pollution that matter is exclusively within the control of the State. Whatever pollution there may be in the river, may be entirely removed by the enactment and enforcement of appropriate laws on the part of the State.

The argument of the City amounts simply to this: that it may be more convenient, and, possibly, less expensive to take water from the Delaware River watershed, than from the Hudson River, and that, therefore, the City of New York should be allowed to do so, even though the source of the pollution of the Hudson River is within its own territorial limits, and even though that pollution could be removed by the arm of the State; hence, the State and the City say, in effect, instead of spending money to prevent pollution in the Hudson River, or to remove it after it enters, we will go elsewhere, regardless of the expense and loss that may be thereby inflicted on a neighboring state.

Moreover, the conclusion of the Master overlooks that even if the pollution of the Hudson River is not removed at its source, the supply may be so treated that the water is purified so that after treatment it would be equivalent in quality to a supply obtained from upland sources.

It may be observed, in this connection, that the approval of the State of New York to the use of the water supply from the Delaware River contains the following condition:

> "(4) All water from these sources before delivery to the distribution system of said city, must first be purified by sterilization with liquid chlorine or otherwise, to the satisfaction of this commission. Upon order of this commission, given in the event that future analysis or inspections shall show necessity therefor, said city must install and operate in a satisfactory manner, approved filter plants or other apparatus for the further purification of this water, or take additional precautions for the protection of the quality thereof." (Exhibit 14, p. 4.)

In other words, according to the decision of the New York State Commission, the water of the Delaware River must be sterilized; and if further analysis shows a necessity therefor, it must also be filtered.

The proof on Hudson River water supply at Hyde Park shows that all that was required to make such water suitable for potable purposes was filtration (R. 2214, 2216, 2217, 2228), with possible additional treatment at times by coagulation (R. 2218).

From this comparison will be noted that the positive requirement of chlorination of the Delaware River water by the State Board is a more severe treatment than is necessary for the Hudson River water.

The Master also states as a controlling consideration that the Delaware River water will be delivered by gravity (R. p. 48; R. 4798).

It may be granted, that as the Master says, "gravity works all the time," but the fact is that many of the largest cities in this country do not receive their water supply by gravity; and it is also a fact that a large volume of the supply of New York City itself, to wit, that received from Long Island, is not operated by gravity.

We respectfully submit that the evidence shows clearly that there is no necessity for the City of New York to resort to the Delaware River watershed.

We will discuss the evidence on this point under two divisions, namely,

(a) The Wasteful Use of the Existing Supply;

(b) Other Available Sources.

The Wasteful Use of the Existing Supply.

Evidence was offered by plaintiff that if the water consumed by the City was wholly metered, the time when an additional supply would be needed would be deferred five years, according to Mr. Merriman's rate of 31 m. g. d. yearly increase (Whitman, R. 2112). The question of the desirability and economy of metering the entire water supply of New York City has been so often recommended by its own consulting engineers and by the Chief Engineer of its Department of Water Supply, Gas and Electricity, that the proof will be presented from excerpts from published reports.

Exhibit 259 contains excerpts from the annual reports of the Chief Engineer of the Department of Water Supply, Gas and Electricity of New York City, for the years 1903, 1905, 1906, 1909, 1914, 1916, 1917, 1919, 1920, 1923 and 1924 on the subject of meterage. The report for 1903 states that at that time 15% of the water delivered to the City was wasted.

These excerpts make a comprehensive presentation of the subject from all angles and show conclusively that the use of water by New York City has been extravagant and wasteful throughout this entire period; that meterage would substantially reduce this waste; that as compared with the limited results obtained by house-to-house inspections at great cost, meterage is the most economical method

to be used; that the City of New-York has been grossly negligent in not installing meters on all services, as has been repeatedly urged and recommended by the Department of Water Supply, Gas and Electricity.

The subject is emphasized as follows, in the 1916 report (p. 259): "I shall not repeat what I said in my last two reports as to the desirability of metering all premises. Meters constitute the best known means of controlling the use and checking the waste of water."

In view of this proof from the mouth of the commissioner in charge of the operation and distribution of the City water supply system, the City cannot, in a court of equity, claim that it should be allowed to divert waters from another state before it has put its own house in order; and, at least, carried out the recommendations of its own officials to restrict waste and increase its available supply by meterage.

Exhibit 260 contains excerpts from the Freeman Report of 1900, showing that Mr. Freeman urged meterage in the strongest and most unequivocal terms. He found that out of 115 gallons per day per capita delivered by the Croton aqueduct, only 40 gallons of water were actually used. Of the 75 gallons per capita which were wasted, he estimated that 65 gallons per capita, or over 50% of the total consumption, were needless and curable waste. Mr. Freeman stated (p. 71 of 1900 report and p. 4 of Exhibit 260): "The one efficient, economical and practical method for lessening the waste of water in New York begins with a water meter on every service pipe."

Exhibit 260 also contains excerpts from the report of the Merchants Association on the Water Supply of New York City, August, 1900, in which it is estimated that out of a delivery of 117 gallons per capita per day, 53% was preventable waste. This agrees well with Mr. Freeman's estimate. A diagram prepared by Mr. Arthur S.

Tuttle, Chief Engineer of the Board of Estimate and Apportionment of New York City, dated October 6, 1927, shows the growth in water consumption in New York City from 1870 to 1927, and the predicted growth to 1950. Mr. Tuttle's diagram shows that the best estimate of water consumption in New York City in 1950 would be 162 gallons per capita under present conditions, and that the probable consumption with universal metering would be 140 gallons per capita in 1950, a saving by metering of over 8%. This would amount, on the basis of Tuttle's diagram No. 1, to 220 m. g. d., or enough to supply the entire city at the present rate of increase of 31 m. g. d. for a period of more than seven years. Under these circumstances there is no immediate necessity of diversion of Delaware River waters for the supply of New York City.

Two objections to metering are made:

1. That it is politically unpopular. If, as these reports show, meterage is economically sound and the water consumers who waste water should pay for their waste, political considerations can have no weight in this court.

2. That it is cheaper to procure additional water than to stop the waste. Aside from being untrue (R. 2113), this contention likewise is without merit.

There are 500,000 taps in New York City of which the larger services, to the extent of about 25% of the total, are metered. At $40.00 per meter for the remaining services the cost of bringing the meterage of the water supply of New York City to a complete, or 100%, metered basis would be about $53,000,000 and by this means the City would save 165 m. g. d. To obtain the same quantity of water from Delaware River would cost $68,000,000.

It is to be noted that other communities have adopted meterage and not one of them has abandoned it.

In support of its contention that it should not be obliged to meter the water but should instead be permitted to take the Delaware River away from New Jersey, defendant City states that meterage is not universal. That is true because general meterage has only been in use during the past twenty years. A table from Engineering News-Record, June 13, 1925, forming a part of Exhibit 260, shows a progressive growth in meterage in 24 of the larger cities in the United States from 1907 to date, and complete or nearly complete meterage in almost all of those cities. The statistics of other cities show that New York City has not adopted modern economic methods in conserving and administering its water supply, but still adheres to the inadequate and wasteful system of selling water on a front foot basis.

Meterage is a remedy that can be undertaken at once. It affords an immediate means by which New York City can place itself in a position where it will have abundant time to obtain other sources of supply.

We quote from the Master's Report on this point, as follows (italics ours):

> "The evidence is conflicting as to the extent to which universal metering in New York City would effect a saving in water consumed. At various times in the past thirty years reports have been made to the City recommending meterage and stating various percentages in the saving of water.
>
> Major Whitman, a qualified witness for New Jersey, estimated that if the City were wholly metered, the time when an additional supply would be needed would be deferred five years.
>
> *Undoubtedly universal metering would make a substantial saving*, as consumers undoubtedly would be more careful in the use of water. I think that is an outstanding and self-evident fact" (Rep. pp. 43, 44; R. 4792).

It further appears from his Report that; "At present the metering in New York City is to the extent of about twenty-three per cent." (Rep. p. 43; R. 4792).

The Master, however, concluded that it was a matter entirely for the City to determine whether the best interests of the City and its water consumers are conserved by a system of universal metering or by some other system (Rep. 42, 43; R. 4791).

Of course, no one questions that under ordinary circumstances each municipality should determine for itself what rates it will charge and what system it shall follow in fixing the rates. But a different situation is presented when a municipality claims the right to take water from other states to the injury of such states in face of the fact that the substantial saving of water which is wasted under the existing system would amount to 165,000,000 gallons per day, an amount which is practically equivalent to the entire amount to be obtained from the so-called first stage—which includes the Rondout Creek and the Neversink River (p. 14 of Ex. P. 4).

We are dealing here with the question of alleged "necessity" and when that question arises it is *not* a matter "entirely for the determination of the City" as to its rates and methods.

Before the City is authorized to obtain a water supply at the expense of substantial damage to its neighbor, it shall at least be required to stop the waste of the existing supply.

Other Available Sources.

Following is a description and an explanation of the plaintiff's exhibits relating to this subject:

Exhibits 243, 248, 249, 250 and 251 (R. 2018 and 2071-6), include location maps, topographic maps and tables of

cost estimates for individual reservoirs and summary of cost estimates for New Jersey's East Hudson Project No. 1, which comprises nine reservoirs, with an aggregate drainage area of 513.5 sq. mi. capable of delivering 450 m. g. d. by gravity to Kensico Reservoir after allowing 24 m. g. d. as a reserve for supply for local communities.

The total cost would be $214,632,398.

Exhibits 252, 253, 254, 255 and 256 (R. 2078-2082), comprise basic information covering New Jersey's East Hudson Project No. 2, including topographic surveys of dams, details of cost estimates of the individual reservoirs and summary of cost estimates, and table of reservoirs.

This project includes 12 reservoirs, regulating an area of 959.9 sq. mi. and capable of providing a net constant regulated flow to Kensico Reservoir of 878 m. g. d. after allowing 36 m. g. d. for supply of local communities, at an estimated cost of $358,209,401 or $408,000 per m. g. d. of net available.

Exhibits 257 and 258 (R. 2085) comprise basic information for the Schoharie Project, including location map and survey of dam site. Details of cost were read into the record (R. 2086) as follows:

Net available yield 431 m. g. d.

Cost estimate $229,800,000 or $533,000 per m. g.

Exhibits 263 and 264 (R. 2183, 2277), comprise basic information regarding the Housatonic and Ten Mile projects, including location map of Ten Mile River dam site and cost estimate for Ten Mile River supply.

Exhibits 265 and 266 (R. 2213-15) give basic information showing locations of structures and cost estimate for a unit of 600 m. g. d. The estimated cost of construction is $123,316,000 and the capitalized cost, including pumping, filtration, operation and depreciation, is $254,029,000 or $423,370 per m. g. of net available supply.

Exhibits 268 to 277 (R. 2246, 2333) are a map of Long Island sources (Exhibit 271) and excerpts from the Freeman, Burr-Hering-Freeman, Spear and Board of Water Supply, Gas and Electricity reports, in relation to Long Island sources. These reports show that at least 200 m. g. d. of excellent water can be obtained from underground sources on Long Island. They show that the development of additional underground water on Long Island has long been recognized as the most readily available supply and the one which could be most quickly developed for New York City's use.

Exhibit 294 (R. 4009) is an effective answer to New York's Exhibit 357.

Exhibit 296 (R. 4021) purports to give in greater detail the cost estimates of New York's Delaware diversion plan appearing in Appendix B of Exhibit 4.

Exhibit 297 (R. 4078) like Barrows' Exhibit 294, is in rebuttal of New York's Exhibit 357, purporting to show capitalized cost of Barrows' alternative supply projects for periods of 50 and 100 years.

The present sources of supply of New York City are admitted by it to be capable of yielding 1,100 million gallons of water per day (Exhibit 244, Report of Thaddeus Merriman on New Sources of Water Supply, dated September 13, 1926, p. 2). The same report gives the water consumption of New York City in the year 1925 as 847 m. g. d. and the rate of increase as 31 million gallons daily per year, leaving a sufficient reserve, on the basis of these figures, to supply the City until 1935. While the figure 31 m. g. d. as the rate of increase in consumption has been commonly used in this case, it was pointed out that this is a very high estimate (R. 2101). For the eight-year period, 1906-1913, the rate of increase was only 3.9 m. g. d., while the rate of consumption in 1928 was only 16.2 m. g. d. over that of 1926 (R. 2101). New York City

contends that an increase in supply will be necessary by 1935, and that Delaware River will provide an increased supply at $75,000,000 less first cost than the next most available source of supply. The cost figures upon which this alleged saving is based do not include the cost of Willowemoc, Beaverkill and Little Delaware reservoirs or connections (Exhibit 4, Appendix "B" pp. 20-22) which Mr. Merriman "assumed" will cost $21,000,000 (Exhibit 364, p. 7).

In the approval of the Delaware project by the New York State Water Power and Control Commission, dated May 25, 1929, the Commission states that there is a "public necessity" for an additional water supply for the City of New York. It does not state that the taking of the Delaware River waters is a matter of necessity but avoids any such statement in carefully guarded language; going no further than the statement that the Delaware River water can be obtained "more cheaply and more quickly than any other; it seems that this, therefore, is the most logical next step for the City to take in extending its water supply system" (Exhibit 13, p. 9).

Necessity can only be sustained as an absolute term. To prove necessity it must be shown that the Delaware River is the only available and suitable source and its use is imperative and unavoidable; otherwise there is merely a question of expediency. If people and property in New York State alone were concerned, conditions of convenience and economy might justify the exercise of the power of eminent domain over private property rights, but where, as here, the exercise of that power is extraterritorial in its effect, and the interests of other states are involved, necessity becomes a different question. Other abundant sources of supply are available, lying wholly within the jurisdiction of New York State, which have been favorably recommended by eminent consulting engineers, including some of the City's witnesses in this case, and who still adhere

to their former recommendations and conclusions as to the suitability and availability of these other sources of water supply for New York City.

In view of the lack of any real necessity the defendants have sought to minimize the lack of necessity by other lines of argument:

1. That public water supply is the primary use of water, and that, therefore, no other use, however important, should be allowed to stand in the way of such use.

2. That public sentiment demands pure, upland sources of supply.

The argument from this is that the rights of the plaintiff and it citizens must bow to public sentiment in New York.

New Jersey, on the other hand, contends that the entire supply of water consumed by New York City should be metered, and if the meterage was complete the necessity for a new supply could be deferred five years, or until 1940, at least. Any contention on the part of New York City that it is now too late for them to secure another source of supply because of the time which would be required to obtain approval of the State Water Power and Control Commission, or for any other reason, is without foundation. Its East Hudson project (as appears from Exhibit 244) is completely developed so far as surveys, cost estimates and determinations of yield are concerned. It was recommended by the New York Board of Water Supply to the Board of Estimate and Apportionment, with full knowledge that any attempt to take Delaware River water would be contested. The report containing that recommendation (Exhibit 244, p. 6) says (italics ours):

> "Our studies of all available sources have brought out in clear relief the possibility of the development of the Delaware watershed and its advantages, but problems readily observable, and continuing delay,

easily conceivable, in adjusting questions of importance to other sovereignties do not justify neglect of the needs of the City of New York, whose interests are paramount, and we have concluded that it is inadvisable *to wait further* the presentation of a plan which will meet the City's requirements and be a complete, permanent and economical unit in our water supply system, furnishing a pure and wholesome water."

There is nothing in the report to indicate that any longer period of time would be required for the construction of this supply than for the construction of the first two stages of the Delaware supply. Furthermore, the quantity of water which would be obtained from the Delaware River as a result of the construction of the first two stages of that supply is as follows (Exhibit 4, p. 14):

Downsville reservoir	370 m. g. d.
Neversink reservoir	70
Total	440 m. g. d.

This is exclusive of the water which would be obtained from Rondout Creek, but it may be pointed out that New York City has had the right to take Rondout Creek ever since 1906, and may take it at any time as a separate project.

It appears that the supply which New York City estimated was obtainable from these East Hudson sources is 434 m. g. d. (Exhibit 244, p. 7, 1st line), or practically the same as from the proposed Delaware diversion.

The report of Mr. Merriman, Chief Engineer (Exhibit 244, p. 4), states:

"The nearest sources which, at this time, are available and which will at the least cost provide a sufficient quantity of water to meet the needs of the city until about 1950, are the east side tributaries of the Hudson River in Dutchess, Columbia and Rensselaer counties."

The report also states (p. 4):

> "Should it not be possible to obtain the right to divert these waters of the Wappinger and Fishkill, an equivalent quantity of water can be secured from either Catskill Creek or Rondout Creek by constructing an aqueduct across the Hudson River."

Primary Use and Public Sentiment do not Control Between States.

Testimony was offered by Weston (R. 3307), Fuller (R. 3047) and Ryder (R. 3563-3565) to the effect that the most important use of water is for domestic water supply. It was also claimed that this is a primary use and takes precedence over all other uses. Of course there is no such legal doctrine. This is a mere matter of engineering opinion. The Federal Government recognizes navigation as of primary importance. The idea that use of a stream for domestic water supply has some preferential standing over other uses applies, legally, only in the case of actual bona fide riparian owners, and then only to such restricted uses as are necessary and common to all riparian owners on the stream. New York City is not a riparian owner on Delaware River and does not enjoy the privileges of a riparian owner even to the limited extent to which diversions are permitted to such owners. This line of evidence is effectively met by Barrows (R. 4012): "Water supply for municipal uses is of primary importance only to the extent that it is a necessity." He also pointed out that whether the use of a stream for water supply purposes was necessary (when other sources of supply were available, even if less economical), could be determined from a consideration of all the uses to which the stream could be put. Under such circumstances, necessity for taking a stream for water supply purposes can exist only where the value or importance of the stream for this one purpose exceeds its value or importance for all other purposes combined,

including sanitation, fisheries, recreational uses, power development and navigation. Where, as is the case here, other suitable and available sources of supply exist wholly within the jurisdiction of New York State, there can be no necessity sufficient to override the sovereign rights of other states.

Testimony was offered by various witnesses to the effect that there is a marked tendency for water supplies to move upstream from downstream places where the pollution is objectionable (R. 3299), and that the modern tendency is to use an upland source and filter instead of treating polluted water (R. 2782-2783). Various examples were cited where it was claimed that public opinion has effected a change in the source of a water supply from an impure, to an upland pure water (R. 3303). This was met by the evidence of various witnesses for New Jersey to the effect that in most of the places cited, the change either was not the result of public sentiment but for purely economic reasons (Whitman, Bayonne, N. J., and Hagerstown, Md. (R. 4254), Horton, Watervliet (R. 4428-4429), Hudson, N. Y. (4432), Paterson, N. J. and Wanaque River (R. 4478), Barrows, Springfield and Providence (R. 4015). Albany was picked by New York City's experts as a shining example of a city which was moving from a polluted source to a pure, upland source of supply, but it was pointed out by Mr. Horton, the engineer who developed the new water supply project of Albany and who, as consulting engineer, has had charge of its design and construction, that the real situation was that in 1898 Albany moved from a pure, upland gravity source directly into the Hudson River (R. 4428-4429); that the reasons for the change from the Hudson River to an upland source were mainly economic reasons, and that there was a strong sentiment in Albany in favor of remaining in the Hudson River; that among the economic reasons were the possibility of obtaining a gravity supply in Albany County (thereby increasing the pressure and improving the fire

protection), the necessity for removing and rebuilding the filter plant if the use of the Hudson River was continued, and the fact that a gravity supply could be obtained for about $9,000,000 as compared with a necessary expenditure, including capitalized operation costs, of $12,000,000 to $17,000,000 if the use of the Hudson River was continued (R. 4429-4432).

Numerous examples were cited where public sentiment has been opposed to and has prevented the adoption of upland supplies, and has retained existing low-level supplies or adopted new low-level supplies, as in the case of Waterford, Troy, Watertown, Cohoes, Watervliet, Saratoga and Mechanicville, all in New York State (R. 4438-4444). The whole matter was summed up by Horton as follows (R. 4441):

> "There is no universal sentiment either way on questions of sources of water supply: It is largely a matter of what nature has provided and the local conditions and economics. A larger investment can usually be made for a gravity water supply in the first instance than for a pumped and filtered supply because there is added to the initial investment of the latter supply the cost of capitalization. There is no universal rule or universal tendency. The rule and tendency are to get as good water as is to be had, taking into consideration the economic effects, both advantages and disadvantages."

The evidence on the question of public sentiment was largely directed against the use of a pumped supply from the Hudson River at Hyde Park. It has no real bearing on the question of necessity because the East Hudson project as outlined by New York City's Exhibit 244 would be a gravity supply from upland sources, similar in character to the Delaware River supply.

Other suitable and adequate sources of supply are available which do not require the taking of waters which naturally flow into other states.

There are three important reports on this question:

The Merchants Association Report of 1899 (Exhibit 272).

The Report of John R. Freeman, dated March 23, 1900 (Exhibit 273).

The Burr-Hering-Freeman Report of 1903 (Exhibit 274).

East Hudson Sources.

These comprise possible sources of water supply located in New York State east of and tributary to the Hudson River and north of the present Croton drainage basin. Waters from these sources, like those from the Delaware, would be conveyed into the existing Kensico reservoir and thence taken to New York City. The streams included are the Fishkill, Wappinger Creek, Roeliff Jansen Kill and Kinderhook Creek and their tributaries. These streams are wholly within New York State except that a small area of rugged, mountainous, uninhabitated territory at the headwaters of Kinderhook Creek is in Massachusetts. None of the water of these streams flows from New York State into any other state. It may be noted, however, that New York City is already using streams which flow from other states into New York State. Five per cent. of the area tributary to the existing Croton supply is in the state of Connecticut (R. 4164).

There have been several propositions relating to these East Hudson supply streams.

General Considerations.

In the Freeman Report (Exhibit 273) Mr. Freeman pointed out (pp. 470-474) that a substantial supply of water could be obtained for New York City by gravity from Fishkill and Wappinger Creeks and other adjacent streams east of the Hudson River and that a materially

greater supply could be obtained by going farther downstream to collect the water. Mr. Freeman states that he made only a crude reconnaissance but the two propositions outlined by him are similar to, though less complete than, the East Hudson project Nos. 1 and 2 suggested by the State of New Jersey.

In the Burr-Hering-Freeman report of 1903 (Exhibit 274, p. 110) these East Hudson sources are described as follows (Exhibit 274, p. 96):

"Fishkill Creek.

Watersheds possessing the highest degree of availability for increasing the water supply of the city must, obviously be so located as to require the least amount of construction work to bring the water in to the distributing system. The watershed of Fishkill Creek fulfills this condition. It lies adjacent to the Croton shed on the north and its waters can be secured more quickly than those of any other supply of equal amount, the course of whose flow is located entirely within the State of New York."

"Wappinger Creek (Exhibit 274, p. 98).

The next watershed in geographical order available for increasing the additional supply is that of Wappinger Creek, lying north of and adjacent to the Fishkill watershed. The reservoir available for the high service development must be built at Hibernia, where a reasonably good dam site is found. This Hibernia reservoir has a contributory area of 90 square miles. * * *

Also in the watershed of Wappinger Creek at Clinton Hollow about two miles northwest of Hibernia reservoir, on a tributary of the main creek, there is a good site for a dam, where a reservoir having a storage capacity of 13,900 million gallons may be constructed. The area tributary to this reservoir is 26 square miles and the high water elevation in it would be 387 feet."

"Jansen Kill (Exhibit 274, p. 99).

Adjacent to the drainage area of Wappinger Creek, on the north, lies the watershed of the Jansen Kill.

At a point called Silvernails on this creek, about 12 miles northeasterly of Rhinebeck, an excellent dam site is found where the high water surface of the reservoir would be 465 feet above Croton datum. The drainage area tributary to this Silvernails reservoir is 149 square miles, and its storage capacity is 17,200 million gallons, the flowage area of the reservoir being 2,014 acres.

The natural development of these watersheds for additional supply would be in accordance with their geographical location, viz.: Fishkill, Wappinger, and lastly, the Jansen Kill, the total drainage area, including that of the Clinton Hollow reservoir, being 346 square miles. If the yielding capacity of these three drainage areas be taken at 750,000 gallons per square mile per day, the addition to the present supply of the city would be 260 million gallons per day. This estimate is probably lower than would be found under actual development, and it may, therefore, be stated that this additional drainage area east of the Hudson River would give to New York city an increased high serviced supply practically equal to that which it is now drawing from the Croton watershed, which has substantially the same area.

As shown by a detailed investigation in another part of this report, the waters of the Fishkill and Wappinger Creeks and the Jansen Kill are materially harder than the Croton water now supplied to the city, in consequence of the large limestone areas found in all three watersheds. It is highly desirable to include in the new system of additional supply softer waters, which, mingled with those from the easterly side of the river, will bring the average hardness down at least to that of the Croton water. This may be done by taking the waters of Esopus Creek."

This last statement of Messrs. Burr, Hering and Freeman, two of whom were witnesses in this action, effectively answers the contention of Mr. Merriman (R. 3108) and Mr. Smith (R. 3166) as to hardness. Furthermore, *not a word is said about objectionable hardness of the East Hudson sources of supply in the report of Merriman to*

the Board of Water Supply (Exhibit 244). It may be noted in passing that John R. Freeman, in his testimony, fully confirmed what he stated in his report of 1900 and in the Burr-Hering-Freeman report of 1903, regarding other available supplies (R. 2461). Freeman also testified that if the Delaware River plans fail, these other projects are still available (R. 2467) and Merriman testified that if the Delaware River plans do not materialize, the next available and best alternative source would be the East Hudson (R. 2706).

1. *New York City's East Hudson Project.*

As noted above, New York City proposed the East Hudson gravity supply project in 1926, as set forth in Exhibit 244. That project contemplated a partial development by storage and diversion of the waters of 550 sq. mi. of area east of the Hudson River, requiring 14 reservoirs and capable of bringing into New York City 434 m. g. d. of new water in addition to increasing the supply and raising the elevation at which a part of the Croton water can be delivered.

2. *New Jersey's East Hudson Project No. 1.*

This proposes a more complete development of 513.5 sq. mi. of drainage area, with a dependable yield of 474 m. g. d. and a net yield available for the use of New York City, after supplying local needs, of 450 m. g. d. (Barrows, R. 2150). This proposition is based on actual surveys, maps of the reservoir sites, and details of cost estimates all of which are in evidence (Exhibits 243, 248, 249, 250 and 251). New Jersey's East Hudson Project No. 1 differs from New York City's East Hudson project, as set forth in Exhibit 244, in that it eliminates several small and costly reservoirs, and increases the storage capacity, and hence the available regulated flow. It cuts down the cost per million gallons and at the same time increases

slightly the available supply. The project is based on actual detailed surveys and cost estimates, and not on a mere reconnaissance or comparison with other projects. The total estimated cost is $214,632,398 or $477,000 per m. g. d. (R. 2018). This cost includes full allowance for riparian damages, both above and below the reservoir sites (R. 2151). In comparing the cost of stages 1 and 2 of the Delaware project, as set forth in Exhibit 4, it should be borne in mind that Exhibit 4 contains no allowance for riparian or other damages south of Tri-State Rock. The cost estimate given by Requardt for East Hudson Project No. 1 was checked and confirmed by Sherman (R. 1995) and Whitman (R. 2099).

3. *New Jersey's East Hudson Project No. 2.*

By going farther down the streams east of the Hudson it is possible to greatly increase the supply areas tributary to the aqueduct and consequently increase the total available supply, as suggested by Freeman in his 1900 report (pp. 472-474). Such a project has been developed and described in the testimony as East Hudson Project No. 2. It comprises the use of the same streams as East Hudson No. 1 but the waters would be gathered together at a pumping station near Fishkill Creek and thence pumped to a sufficient elevation so that they would flow into Kensico Reservoir. In determining the cost as compared with other projects, the capitalized cost of pumping in perpetuity is added to the initial investment. Surveys of dam sites and details of cost estimates are fully set forth in Exhibits 252, 253, 254, 255 and 256 and in the testimony of Requardt (R. 2078). This project includes 12 reservoirs, regulating an area of 959.9 sq. mi. and capable of providing a net constant supply for New York City of 878 m. g. d. after allowing 36 m. g. d. for local communities. The total estimated cost is $358,209,401 or $408,000 per m. g. d. (R. 2083).

These yield and cost figures were independently computed or checked and approved by Sherman (R. 2158), Barrows (R. 3960) and Whitman (R. 2099).

Comparison of Costs.

Merriman criticized the East Hudson project on the ground that the cost estimates were low and the estimated yield too high. Every detail of cost estimates was available to Merriman, yet he has not pointed out a single item as to quantity or unit price which was deficient, or given a single quantity or unit price used in the estimates of cost of his East Hudson project.

New York City's estimate of East Hudson sources is $650,000 per m. g. d., whereas New Jersey's estimates are: East Hudson Project No. 1, $477,000 per m. g. d., and East Hudson Project No. 2, $408,000 per m. g. d. (R. 2089). By eliminating small and costly reservoirs and at the same time increasing the storage from 142 billion gallons, as estimated for the New York City project, to 160.6 billion gallons, as estimated for the New Jersey's project, New Jersey has reduced the cost to New York City of a gravity supply from East Hudson sources from $275,000,000 to $214,000,000.

Considering that the "assumed" additional cost of $21,000,000 for the Willowemoc, Beaverkill and Little Delaware reservoirs and connections (Exhibit 296, p. 7), is not included in the cost of the Delaware project (Exhibit 4, Appendix "B", pp. 20-22), and further considering that diversion damages below Tri-State Rock are not included in the Delaware River cost estimate, the alleged difference in cost (R. 2089) is not only eliminated but there is set up a substantial sum on the other side of the ledger. Further consideration will be given to the relative costs after the additional alternative projects are described.

Hudson River Pumping Project.

Hudson River is a tidal stream from its mouth 150 miles upstream to Troy (R. 2119). Salinity, however, ends south of Poughkeepsie. The taking of a water supply from the Hudson River at Poughkeepsie or Hyde Park, a few miles upstream, was considered in all of the three reports (Exhibits 272, 273 and 274). The Merchants Association Report (Exhibit 272, pp. 7-8) states:

"Hudson River Supply.

All the additional water that the City of New York is likely to need for many years to come, until its population shall increase to 18,000,000, can be obtained from the Hudson River above Poughkeepsie. It is proposed to build pumping stations and filter beds on the east side of the river, an aqueduct from Poughkeepsie to the northern limits of this city, and a reservoir near the northern limits. The plant thus constructed would be capable of supplying 250,000,000 gallons daily although it is not proposed to build a plant capable of delivering at first more than 100,000,000 gallons daily. The 250 million gallons a day, combined with the present supply, will meet the needs of the city for fifteen or twenty years to come. Thereafter increased pumping facilities at the same point, with additional aqueducts, will furnish an additional supply in any amount up to 1,500 million gallons daily. It is proposed to filter this water, the experience of other cities having shown that filtration is a perfect method of purifying water, being, indeed, only a scientific reproduction of a process of nature. That filtration is effective in removing impurities and germs of disease is amply proved by the experience of Albany, Poughkeepsie, London (England), Hamburg (Germany) and other cities. It has already been recommended by the Health Board of the city for the Croton water.

The watershed from which this supply may be drawn comprises all the streams flowing into the Hudson above Poughkeepsie, including the Adirondack region. The area of the watershed is approximately 11,800 square miles.

In order to prevent the water above Poughkeepsie becoming brackish, by reason of taking so large an amount of water from the river at that point, it is proposed to build in the Adirondacks compensating reservoirs, in which may be stored the freshet waters during the months of excessive rain. These waters are to be delivered into the river during the dry season, so that the flow of water may be kept even throughout the year.

Incidental benefits would be the improvement of the navigation of the upper waters of the Hudson, the prevention of floods and the provision of a uniform flow for the mill owners along the various streams.

That the project is entirely feasible, the report of the Engineering Committee leaves no doubt. It has already had examinations made for reservoirs at various points in the Adirondacks, and has shown that it is entirely practicable to obtain the necessary storage without excessive cost." (See also pp. 22 and 23 and pp. 55-56.)

It may be noted that some of the reservoirs referred to for the purpose of regulating the stream have already been constructed, as described later.

The Burr-Hering-Freeman report (Exhibit 274, p. 103) states:

"The water taken from the reservoir near Hyde Park could by filtration be rendered palatable and entirely safe for drinking, domestic and industrial use."

Also (p. 101):

"Filtration, according to the best practice of today is capable of removing all of the objectionable elements at a reasonable cost. More than 25 millions of people are now supplied with filtered water in Europe alone, and further millions are on the eve of being supplied with it in America. In every well studied case of the introduction of efficient filtration, water-borne diseases have been found to be greatly reduced."

The Commission recommended the use of slow filters (Exhibit 274, p. 102). At that time, modern rapid sand, mechanical filters with high efficiency and low cost, had not been developed to a sufficient point so that they had come into general use. The Burr-Hering-Freeman commission, however, recognized the low cost and possible advantages of rapid sand filters (Exhibit 274, p. 102).

The Freeman report of 1900 (Exhibit 273), covers much the same ground as Exhibit 274 in relation to the use of Hudson River water.

This report states (Exhibit 274, p. 80):

> "An almost unlimited quantity can be taken just above Poughkeepsie and purified by filtration, just as Poughkeepsie has done for its own public water supply for upwards of twenty years, or just as Philadelphia is about to purify the Schuykill and Delaware water for general use."

Since these reports were written there have been great advances in the art of water purification. This was admitted by Professor Burr (R. 3156). Merriman also admitted that there was no practical difficulty in filtering Hudson River water at Hyde Park (R. 3132). The present project is greatly superior to the projects proposed in these three reports, by reason of advances in the art of filtration during the past thirty years (R. 2238). Hazen admitted (R. 2969) that purification of the Hudson River would produce water meeting current requirements. The principal changes in conditions which have taken place since the reports contained in Exhibits 272, 273 and 274 were prepared, are:

1. Advance in the art of filtration.

2. Increased regulation of Hudson River.

The Sacandaga Reservoir (R. 2212) as shown in the report of the New York State Conservation Commission, has a capacity of 36 billion cubic feet, or more than the

combined capacity of all of New York City's proposed reservoirs on the Delaware. This reservoir has just been completed. There are also other reservoirs on the tributaries of the Mohawk, built in conjunction with the New York State Barge Canal. As a result of this regulation the line of salinity of Hudson River has been pushed downstream (R. 2211) and the conditions greatly improved. The low-water flow has been brought up from around 2,000 or 2,200 c. f. s. at Poughkeepsie to about 5,200 c. f. s. by the Sacandaga Reservoir (R. 2213), and this has more than doubled the dry weather flow. There are other sites available by which the low-water flow can be still further increased (R. 2213). Suter, a witness for New York State, admitted the beneficial effect of regulation of the Mohawk and the Sacandaga Rivers (R. 2443) and stated that the Sacandaga Reservoir would about double the low-water flow at Albany (R. 2445). Hazen also stated that the low-water conditions at Poughkeepsie have been much better during the last fifteen years (since the Barge Canal Reservoirs were built) than hitherto and that with the Sacandaga Reservoir as recently completed, there will be no danger of salinity at Poughkeepsie (R. 2971).

Coming down to the present possibilities of the use of Hudson River at Poughkeepsie, this project has been described in full by Pearse (Exhibits 265 and 266, R. 2213). Basic information is given showing locations of structures and cost estimates for a single, 600 m. g. d. unit. The initial investment or first cost for a 600 m. g. d. unit would be $123,316,000 or $205,000 per m. g. d. capacity. This is only about half the investment for any other available source of supply. Of course, the cost of water production would include pumping and filtration and the total operating cost, including capitalized expenses for pumping, filtration, operation and depreciation in perpetuity is $254,029,000 or $423,370 per m. g. d. (R. 2221). This filter plant would produce water of satisfactory quality which

would meet U. S. Treasury standards (R. 2223). It is possible to develop a supply of 2,400 m. g. d. with future regulation (R. 2215) and there is no difficulty in taking 600 or 1,200 m. g. d. from Hudson River at Hyde Park under present conditions (R. 2239).

The advantages of the Hudson supply are:

1. It disturbs no one's rights.

2. It is located closer to New York City than any other source of supply considered, except Long Island; Hyde Park being only about 45 miles from Kensico Reservoir (see map, Exhibit 4).

3. The supply is all available at one point and in larger total volume than from any other source.

4. The supply can be developed progressively in units of any size so as to meet the rate of growth and economic conditions in New York City.

5. It involves a minimum installation, or first, cost, amounting to only $205,000 per m. g. d. or half the first cost of any other source of supply.

6. Including capitalized pumping, filtration and operation charges, the cost per m. g. d. is nearly as low as that of any other available source of supply.

In view of the record of New York City's approval of this project (Exhibits 272, 273 and 274), no one can maintain that this project would not supply adequate water of suitable quality at a reasonable cost.

Various indirect criticisms and objections were made by witnesses for New York City, all of which amount substantially to the contention that the water is initially polluted, and hence undesirable from the viewpoint of public sentiment, however excellent the quality of the output of the filter plant may be.

As to the question of pollution, this chiefly enters at and above Albany, the population tributary between Albany and Poughkeepsie being but about 70,000, while at and above Albany the urban population is around 560,000 (R. 4252). Yet Albany successfully filters this water at the present time. The filtered water at Albany has no taste or odor and is suitable for drinking purposes (R. 4474), and there have been no complaints of it for the past five years (R. 4294). Many cities and towns use the Hudson River water as it is, including Albany, Poughkeepsie, Waterford and Renssalaer (R. 2215). Many cities use waters more highly polluted than that of the Hudson River at Albany and obtain successful results; for example, Chester, Pa., where the filtered water meets U. S. Treasury standards, but is subject to conditions worse than at Poughkeepsie, Hyde Park or Albany (R. 3325). But the condition of the Hudson River water either at Albany or Poughkeepsie is not a fair criterion of the water to be treated at Hyde Park; first, because of the large amount of storage in the river channel between Albany and Poughkeepsie. This would provide 10 to 30 days' storage and reduce the bacteria by 90 to 98% (R. 2219). Bacterial purification by storage is utilized by New York City, London and Boston and many other cities (R. 2219) and is an important factor of safety (R. 2219). There is no lack of examples in the United States showing that communities have successfully treated water such as the Hudson River (R. 4271). The conditions for operation of a filter plant at Hyde Park would be much more favorable than at Albany or Poughkeepsie and would unquestionably operate successfully and produce a safe and satisfactory water (R. 4291). The degree of pollution of the Hudson River is below the permissible filter loading of the U. S. Public Health Service (R. 4291). The pollution at Hyde Park as indicated by the B. coli index is much below that either at Albany or Poughkeepsie (R. 4291).

Conclusions as to condition of water to be treated at Hyde Park cannot be correctly based on analyses taken at the Poughkeepsie water supply intake because the tide carries sewage discharged into the river at Poughkeepsie and also from the State hospital back into the Poughkeepsie intake (R. 4290). This polluting material is not, however, carried upstream to Hyde Park (R. 4253). The B. coli content at Poughkeepsie in 1926 to 1928, inclusive, averaged 4,570 per 100 c. c., while the analyses at Hyde Park show only 10% as high a B. coli content (R. 4272).

The objections which have been raised to the Hudson at Hyde Park as a source of supply are either based on erroneous data derived from conditions at Albany and Poughkeepsie, which are not comparable, or else they are based on conditions existing thirty years ago before the development of the present storage regulation on the Hudson River and before the development of modern methods of water purification, and they leave out of consideration the extensive self-purification, amounting to some 90% or more, which would take place during the ten to thirty days' storage of the water between Albany and Hyde Park. There is no proof of any public sentiment in New York City opposed to the use of the Hudson River water with proper filtration. The proof is to the contrary. All three of the engineering commissions which have made elaborate reports on this project have reported favorably, as shown by Exhibits 272, 273 and 274.

The general objection to the Hudson River on the ground that it requires filtration carries no weight in view of the fact that the State Water Power and Control Commission in its decision (Exhibit 14, p. 4) requires that the City of New York shall include provision for a filter plant in connection with the Delaware supply and Merriman has testified that this is a "wise provision" (R. 3133). Neither is the Delaware above the proposed points of diversion free of pollution. New York City's five reser-

voirs are all located in the heart of an intensely developed summer resort region. On the East Branch, immediately on the banks of the river and upstream from the principal reservoir at Downsville, are several populous communities: Margaretville, Fleishmanns, Arkville, Roxbury and others, all of which are summer resort centers, with large hotels adjoining the river. That such pollution exists is recognized by the Water Power and Control Commission, since one of the conditions imposed was the provision of a sewage system and sewage treatment plants to take care of this pollution (Exhibit 14, p. 3, pgf. (3)).

Schoharie Creek.

Exhibits 257 and 258 and the testimony of Requardt give basic information relative to additional supply available from Schoharie Creek. The cost estimates (R. 2085, 2086) are based on actual surveys and full details of types of structures, quantities of material and unit prices are available. The yield is estimated at 431 m.g.d. from a drainage area of 564 sq. mi. located downstream from the present Gilboa dam, with a dam located near the Village of Esperance. In determining the yield, an allowance of 20 m.g.d. has been made for local uses. The total estimated cost is $229,813,693 or $533,000 per m.g.d. (R. 2085-6). This would be a gravity project delivering water to Kensico Reservoir. No figures were given in criticism of the Schoharie project except the evidence of Merriman to the effect that the water was harder than some of the other source of supply. Merriman gave the net available yield of the Schoharie project as 450 m.g.d. or more than estimated by Requardt (R. 2716). There is no evidence that the water is objectionably hard, and it would, like waters from the East Hudson sources, be greatly reduced in hardness by mixing with the waters derived from the Esopus supply.

Requardt's estimates of cost and yield of the Schoharie project were checked and approved by Barrows (R. 2151). Inasmuch as New York City is now using 250 m. g. d. of water from Schoharie basin there can be no valid criticism of this source of supply.

Long Island.

The Merchants Association, Freeman, and Burr-Hering-Freeman reports (Exhibits 272, 273 and 274) and the Spear report (Exhibit 270) show that the development of additional underground water on Long Island has long been recognized as the most readily available supply and the one which could be most quickly developed for New York City's use, and that between 200 and 300 m. g. d. of additional water could be obtained at reasonable cost (R. 2268). The Spear report (Exhibit 270) was made in 1912. The principal investigation was begun in 1903 and Mr. Langdon Pearse was engaged on that investigation (R. 2265). In order to bring the matter down to date, Pearse was engaged to re-examine the Long Island situation to determine what, if any, changes were necessary for this development at the present time. Mr. William E. Stanley was detailed to this work and the results of his field investigation are in evidence (R. 2243-2258). As a result of his examination he states (R. 2251):

> "The investigation in the Spear report brought out that the southerly Suffolk county area of some 332 sq. mi. was available as an economical development for additional water supply for New York City. There is some development which may reduce this very slightly and I have figured the area at 326 sq. mi. * * * The Spear report indicates a quantity of 250 m. g. d. Subsequent and more complete data on the development of the Ridgewood area indicates that is perhaps a low limit. An upper limit of 300 m. g. d. is, in my opinion, feasible, after local requirements are provided for."

Stanley states (R. 2253) that the project described in the Spear report can be developed now with two slight modifications. One of these would involve moving the line of the aqueduct somewhat farther north and the other is a change in one of the reservoirs (R. 2253).

Pearse also testified that it is still feasible for New York City to secure a water supply from Long Island sources to the extent of 250 m. g. d. He believes that 250 m. g. d. are certain and probably 300 m. g. d. (R. 2266). He also says there are no engineering reasons why New York City cannot obtain from 250 to 300 m. g. d. from Suffolk County (R. 2268). The revision of the Spear cost estimate of 1907 indicates the present cost of the Long Island project to be $698,200 per m. g. d. for a 300 m. g. d. yield. This includes all construction and capitalized operating expenses (R. 2254).

The principal criticism of this evidence was the opinion of Merriman that the available yield is most likely nearer to 225 m. g. d. than 300 m. g. d. (R. 3108). Whether the net available yield is 225 m. g. d., 250 m. g. d. or 300 m. g. d. is relatively immaterial. The fact is that here is a water supply which can be developed immediately and which, as the subsequent excerpt from the report of Walter E. Spear to the Board of Water Supply shows, will yield a water "wonderfully pure and in appearance, taste and temperature, most attractive for domestic or industrial use."

The following excerpt is from Exhibit 275 (pp. 123-125 of printed pamphlet):

> "Suffolk County Ground-Water Sources.
>
> If the ground-waters of Suffolk county were available, they could be cheaply and quickly developed to provide an emergency supply for the relief of Brooklyn borough, and they could be made to eventually furnish to New York City a large permanent supply of excellent water for domestic and commercial uses.

An average supply of 250 million gallons per day could safely be obtained from a catchment area of 332 square miles in southern Suffolk County and the Peconic valley. This supply could be appropriated from the large volumes of ground-waters now running to waste there, without material injury or annoyance to local interests. The total cost of the works to obtain this supply, delivered into the distribution system of Brooklyn borough, is estimated at $47,173,000."

"Sources in Suffolk County to be Developed for New York City.

The Suffolk County sources that would yield by far the best supply of water, and of which the development would cause the least disturbance to Suffolk County residents, are the ground-waters found in the deep sand and gravels of which the soils and substrata of Long Island are made up.

Quality of Ground-Waters.

The waters from the Suffolk County sources would, on the whole, be better than the ground-waters of the Ridgewood system because of the more favorable location proposed for the collecting works and the smaller population on the proposed Suffolk County watershed.

The normal ground-waters in Suffolk County that are gathered outside of the villages, and at some distance from habitation, are remarkably soft, and all the ground-waters are naturally clear, colorless and free from any pollution or infection, because of the perfect filtration of the rainwater that takes place in passing through the surface soils, and the suffocation and starvation of organic life that occur during the months and years in which these waters remain in the earth. Altogether, these ground-waters are wonderfully pure and in appearance, taste, and temperature, are most attractive for domestic or industrial use."

"Amount of Water to be Appropriated from Suffolk County Sources.

On the basis of a unit yield of 800,000 gallons per day per square mile, the total average collection from the catchment area of 332 square miles in Southern Suffolk County and in the Peconic valley would be 266 million gallons per day."

It is clear that there is ready at hand a supply of at least 225 m. g. d. of water of the highest and best quality immediately adjacent to New York City. This, at a rate of 31 m. g. d. per year increase would, if developed, prolong the period of time before another source of supply is needed by more than seven years or until 1942 at least.

Housatonic and Ten Mile Rivers.

Nearly the entire drainage basin of Ten Mile River lies in New York state (R. 2185) and the proposed reservoir thereon would be wholly in New York state (R. 2188). The river flows into the Housatonic River in Connecticut near the state line (R. 2193) and Housatonic River and most of its drainage basin are in Connecticut (R. 2185). Ten Mile and Housatonic Rivers were recommended by Freeman in 1900 as the best available, as is shown by the following excerpt from Freeman's report (Exhibit 273, p. 65):

"Available Additional Sources.

(1) The cheapest and most available source, by far, if the Connecticut Legislature will co-operate in permitting it to be obtained, is the Ten Mile river combined with the Upper Housatonic, which, with no expense for pumping and with comparatively short aqueducts, will deliver 750 million gallons (and possibly 800 million gallons) per day by gravity flow, in the very driest years, at the city limits, from a large new distributing reservoir, at a hydraulic grade of 300 feet above sea level, at a cost, which, if reckoned on the whole quantity, will probably not exceed $10 per million gallons, even if land and water damages are extravagantly high.

> This whole 800 million gallons per day of Housatonic water can be delivered in New York for about half the total annual expenditure that the 200 million gallons per day from the Esopus, and its connecting watersheds would have cost on the terms tendered by the Ramapo Company and with greater certainty of delivery in years of low rainfall, and much greater safety of structures."

Housatonic River lies close to the Croton drainage basin and is capable of yielding 750 or 800 m. g. d. as estimated by Freeman, and 918 m. g. d. as estimated by Requardt (R. 2185). This source is not considered as available for use by New York City.

There can, however, be obtained by gravity from Ten Mile River in New York state a supply of 200 m. g. d. at a cost of $75,508,314 (R. 2194; Exhibits 263 and 264). This would be at a net cost of $375,000 per m. g. d. if the entire stream was diverted (R. 2195) but not including diversion damages in Connecticut. In other words, on an exact parity with New York City's estimates for her Delaware project, the cost of a supply of 200 m. g. d. from the Ten Mile River would be materially less than the cost of water from Delaware River and much less than the cost of any other available source of supply (R. 2195), except that saved by meterage.

If New York City can take water from the Delaware tributaries it can take water from Ten Mile River, which flows from New York state into Connecticut. This source has the advantage of immediately adjoining the Croton drainage basin and can be developed in a very much shorter time than the Delaware resources.

It may be urged that the supply from Ten Mile River is too small, but it can be combined with the Long Island sources, which will yield at least 220 m. g. d., and with a saving of 165 m. g. d. by meterage, an effective increase in the supply for New York City of at least 485 m. g. d. is

available, whereas upon completion of the second stage of the proposed Delaware River development, New York City would obtain an increase of supply from the Delaware River and Rondout Creek of from 510 to 540 m. g. d., or but little more (see Exhibit 4, top of p. 15).

Comparison of Cost of Delaware and Alternative Sources.

Before comparing the cost and available supply from other or alternative sources, some attention must be given to the cost estimates presented by New York City for the Delaware project (Exhibit 4). Exhibit 296 purports to give in detail the cost estimates of New York City's Delaware diversion plan as summarized in Appendix B of Exhibit 4. Plaintiff asked for detail data forming the basis of these cost estimates including the usual information as to dimensions of structures, quantities of materials, unit prices and itemized costs. No such data are furnished in Exhibit 296. In effect, Exhibit 296 is equivalent to the statement regarding the Downsville reservoir that it ought to cost 1½ times as much as the Ashokan reservoir. No data are given by which this or any other of the costs appearing in Exhibit 296 can be checked and their reasonableness or accuracy determined. Taking this as a single example, as pointed out in the evidence (R. 4022) the conditions at Downsville and Ashokan dam are widely different. The main Ashokan dam is founded on rock, while at Downsville there is, as testified by Merriman, deep glacial fill in the valley. As stated by Barrows (R. 4022), New York City's estimate of cost of the Delaware project as given in Exhibits 4 and 296, "appears to be merely a rough guess as to cost." New York City has not submitted any actual detailed estimate of the cost based on surveys, borings and quantities of materials on which the Court can base a fair judgment as to what will be the cost of the Delaware project, in comparison with other available projects.

Burr testified that more detailed figures were available in the office of the Board of Water Supply within a month before he testified (June 27, 1930). He could have looked at them, but he did not do so.

Merriman testified (R. 2687) that he had destroyed the original figures from which the cost summaries given on Exhibit 4 were derived. There is no proof in the case that Exhibit 296 is even a duplicate of the original figures. At best it is nothing more than a comparison based on the alleged cost of other structures, without the details of cost of such structures, or proof that the structures, quantities of material or unit prices in the two cases would be identical or even similar. But, in addition, New York City has nowhere submitted an estimate of cost of any kind of the complete Delaware project for the diversion of 600 m. g. d. All that is given in Exhibits 4 or 296, or anywhere else, is a summary of cost estimate down to the completion of the first and second stages. This includes only the Rondout, Neversink and Downsville reservoirs. Downsville is the largest, and these are the three nearest at hand and consequently without doubt the cheapest to construct. They would yield a supply of 510 to 540 m. g. d. How much it would cost to complete the project or what the cost per m. g. d. would be if the small, costly and remote reservoirs on the Little Delaware, Beaverkill and Willowemoc were added, is not anywhere shown except from Merriman's "assumed" approximation on Exhibit 296 (p. 7). But these are a definite part of the Delaware project.

On the other hand, plaintiff has submitted complete detailed cost estimates of alternative sources of supply. These figures were made with a high degree of engineering skill and experience and checked and confirmed by equal skill and experience. They are as accurate as it is possible under similar conditions. They represent the fair cost at which New York City can obtain an adequate and suitable increase in her water supply.

Under these circumstances how can it reasonably be said that there will be a saving to New York City from the use of the Delaware as compared with other sources of supply available, since even as regards the first and second stages, the cost as given in Exhibit 4 is incomplete and only approximate. The New York State Water Power and Control Commission requires provision for a filter plant, yet nothing is included either in Exhibits 4 or 296 for either the construction or capitalized maintenance and operation of a filter plant for the Rondout and Delaware waters.

Nothing appears in either Exhibits 4 or 296 covering the item of damages in New Jersey and Pennsylvania resulting from the Delaware diversion (R. 2119).

Nevertheless, taking the figures as they are and omitting items included in Exhibit 4 for work south of Kensico Reservoir, the total cost estimate for a supply of 510 to 540 m. g. d., according to New York City's own figures, is $413,000 per m. g. d. (R. 2087; 2118).

The alternative sources of supply thus far described are summarized in the subjoined table, with cost estimates and references to testimony. All the figures are given on the basis of delivering water to Kensico Reservoir, and where pumpage or filtration are required, the capitalized cost of operation is included. In the case of the Hudson at Hyde Park, the supply is figured on the basis of 1,200 m. g. d. at present available and the cost is that for two units of 600 m. g. d. each, at the price given by Pearse (R. 2222).

Summary of Alternative Supplies.

Project (1)	Ref. R. to R (2)	M.G.D. (3)	Total Cost (4)	Cost per m.g.d. (5)
		I		
East Hudson (N. Y. City plan)	2089	422	$ 275,000,000	$650,000
East Hudson No. 1 (N. J. plan)	2089	450	214,000,000	477,000
		II		
East Hudson No. 2 (N. J. plan)	2083–4	878	358,209,401	408,000
Hudson at Hyde Park	2222	1200	508,058,000	423,000
Schoharie	2085	431	229,813,693	533,000
Total, these three...	3817-18	2509	1,096,081,094	437,000
		III		
Saving by meterage ...	2114	165	53,000,000	321,200
Long Island	2254	300	209,460,000	698,200
Ten Mile	2194	100	75,504,314	750,000
Total, these three ...	..	565	337,964,314	598,000
Total of all above	..	3074	..	467,000
Delaware, 1st and 2nd stages only, including Rond-out	2118	510	..	413,000

Exclusive of filter plant, and damages in New York and Pennsylvania.

The first two items show that New York could obtain 422 m. g. d. by gravity from the East Hudson sources at a cost of $650,000 per m. g. d. according to her own figures, but according to the evidence of actual surveys and detailed cost estimates by plaintiff, it is possible to obtain 450 m. g. d. from these East Hudson sources at a cost of $477,000 per m. g. d. This is for a wholly gravity supply and is to be compared with a cost of $413,000 per m. g. d. for stages 1 and 2 of the Delaware project based on New York City's figures, exclusive of filter plant or damages in New Jersey and Pennsylvania. If these items were included there can be no doubt that the cost of the East Hudson Project No. 1 would not exceed and would probably be less than the cost of stages 1 and 2 of the Delaware project.

The most desirable project from the East Hudson sources is, however, No. 2, a combined gravity and pumping project, which will yield 878 m. g. d. at a cost of $408,000 per m. g. d., including all items, as compared with $413,000 per m. g. d. for stages 1 and 2 of the Delaware project, exclusive of filter plant and damages in New Jersey and Pennsylvania omitted.

The Hudson at Hyde Park will supply 1,200 m. g. d. at a cost, including all items, of $423,000. This is much less than would be the cost of stages 1 and 2 of the Delaware project, taking the cost at New York City's figure of $413,000, exclusive of filter plant and damages in New Jersey and Pennsylvania.

Taking the three projects summarized in Section II of the table, these will yield a total supply of 2,509 m. g. d. or more than four times the total amount which New York City proposes to get from the Delaware, and at an average cost for the whole amounting to $437,000 per m. g. d. Again, this is less than would be the cost of the 600 m. g. d. from the Delaware, if the filter plant, damages

in Pennsylvania and New Jersey, and the cost of the reservoirs on the Little Delaware, Willowemoc and Beaverkill are included.

Referring to Section III of the table; by combining the saving by meterage of 165 m. g. d., the Long Island supply, and the supply from Ten Mile River, on a gallon per gallon basis, it appears that New York City could obtain 565 m. g. d. from these sources at a cost of $598,000 per m. g. d. This is a reasonable cost in view of the fact that New York City's engineers have repeatedly recommended the Long Island supply as reasonable, although this supply would cost $698,200 per m. g. d. If the supply from Long Island was 225 instead of 300 m g. d., these last three sources described would give a total supply at 490 m. g. d. at an average cost about the same as that of the Long Island supply alone.

If, now, all the above sources, including saving by meterage, are combined, it appears that there are available for New York City's use, alternative sources all located within New York State, adequate to give 2,974 m. g. d., exclusive of Ten Mile River, or if Ten Mile River is included, the available sources, exclusive of the Delaware, are adequate to supply 3,074 m. g. d. at an average cost of $467,000 per m. g. d. This is not in excess of what it would cost per m. g. d. to obtain 600 m. g. d. from the Delaware if all of the items properly appurtenant thereto had been included and properly figured in the cost estimate. At the rate of increase of 31 m. g. d. per year these sources are adequate to supply the increase in New York City's water consumption for a period of 100 years (R. 2268).

It is, however, to be borne in mind that the Hudson River at Hyde Park is capable of yielding not merely 1,200 but 1,800 or 2,400 m. g. d., as may be required. In other words, there are available to New York City wholly within the Hudson drainage basin and on Long Island, and exclusive of Ten Mile or Housatonic Rivers, more than

four billion gallons per day, all at reasonable cost and from sources which will furnish water which New York City's engineers in their published reports have described and recommended as suitable and satisfactory for public use.

Merriman criticized some of the above figures involving capitalized costs, and in support of his contention, he submitted New York City Exhibit 357. This was effectively answered by Professor Barrows (Exhibit 294; R. 4009). In determining the cost of the various alternative supplies, Merriman, in preparing Exhibit 357, multiplied the estimated annual overhead and operating charges by the period of years—say 50 years—for which the estimate was made, and added this to the construction cost. The error of this method is obvious. The operating charges for the fiftieth year in the future do not become due or require payment for fifty years. The amount of money necessary to be invested at the present time to build and operate the plants for a period of fifty years is therefore the construction cost plus the present worth of an annuity representing the annual operating charges for the given period, say 50 years. It is really immaterial whether a fund is set aside at the start to provide this annuity or not. If the money is not set aside then it remains in the pockets of the citizens of New York for their use and they will benefit by the increment of return from its investment or use in business until the money is required for operating expenses in the future. Thus $1.00 remaining in the pockets of the citizens for a period of 50 years becomes a much larger sum at that time, available for annual payments of operating expenses. This is just as true as if the money is invested today in a sinking fund. Estimated on this basis, which is the only correct and general method of capitalization in use among engineers or financiers, the final costs per million gallons for a supply from different projects, as shown by Exhibit 294, are as follows:

For 50-year period—

East Hudson No. 1	$82
East Hudson No. 2	77
Schoharie	90
Hudson River	56
Delaware River (without riparian damages)	78

For 100-year period—

East Hudson No. 1	$38
East Hudson No. 2	32
Schoharie	43
Hudson River	27
Delaware River	35

These costs are all so nearly alike that it cannot fairly be said that any one is unreasonable or excessive. Neither can it be said that any one of these projects is so costly as to be prohibitive or out of reach of New York City. The differences are in general within the limits of error of such cost estimates. Taking the figures as they are for the 100-year period, it cannot be disputed that the Hudson Pumping Project and East Hudson Project No. 2 will both produce water at less cost for New York City than the Delaware River Project. The cost of the Schoharie project is a little higher, but New York City has already taken part of the Schoharie watershed and from its own reports it is evident that it considered the development of the lower Schoharie entirely within the limits of feasibility.

Similar figures were presented by Sherman (Exhibit 297, R. 4078). This, like Barrows' Exhibit 294, is in rebuttal of New York City's Exhibit 357, purporting to show capitalized cost of Barrows' alternative supply projects for periods of 50 and 100 years. It is based on a somewhat different method of computation than that of Barrows' Exhibit 294 and shows even lower costs for periods of 50 and 100 years; fully confirming the proposi-

tion that the costs given by New York for these time intervals by Exhibit 357 for alternative supply projects are grossly excessive.

Let it be remembered that the operating costs of the defendant City's water plant are not raised in the City's annual tax budget. They are paid out of the revenues of the service, which is conducted at a profit. The answers of the defendant City admits a surplus revenue in 1928 of over one million dollars (pgf. 17, p. 10). On any new projects the operating expenses would be paid currently out of the proceeds of the sale of the water.

The whole matter was effectively and briefly summarized by Barrows and Sherman. Barrows stated (R. 3960) that East Hudson Project No. 2 gives a net yield of 878 m. g. d. It would cost $358,000,000, including the capitalized cost of pumping. East Hudson Project No. 2 will therefore give about 1¾ times as much water as the Delaware-Rondout project and at a less cost per m. g. d. of capacity. Sherman stated (R. 4077) that at the end of 50 years the lowest cost of water is East Hudson Project No. 2, the next would be the Hyde Park Pumping project, and the third the Delaware River project.

Having shown available sources of supply of suitable water to provide for New York City's future requirement for the next hundred years, it is unnecessary to pursue the other sources heretofore considered by the City, namely, Wallkill River, Adirondack sources (Exhibit 272, pp. 61, 78, 88; Exhibit 273, p. 81), and Lake George (Exhibit 274, p. 64). All these are still available.

Conclusions.

Defendant City's proof does not sustain the proposition that water from the Delaware tributaries is more desirable in point of quality or quantity than water from the other sources above discussed. All the documents and reports

made by the City's own engineers and officers show that these other sources offer supplies of acceptable quality and no definite proof has been offered to the contrary.

Nor has the defendant City shown by any proof that the Delaware project will furnish water at a less cost than any of the others discussed. A mere statement cannot be accepted as proof without evidence to support it. On the contrary thoroughly competent engineers have collaborated in the preparation of, or separately computed, the cost of these other projects, based on actual surveys, unit prices, and quantity of work and materials, and the details of their figures are before the Court, without criticism or attack, in any specific particular.

However, we do not consider that the question of whether one source of supply is cheaper than another has any bearing on this case. Where the rights of others are involved it is not permissible in a court of equity to claim that those rights should be invaded in order to save money for the invader. It is always cheaper to trespass upon another's right than to pay for the equivalent. This plea was urged by the Chicago Sanitary District in *Wisconsin* v. *Illinois* (278 U. S. 367), as it previously had been in *Sanitary District* v. *United States* (266 U. S. 405), but in both cases it was rejected.

The theory of necessity, as urged by defendants, has no foundation in law. It is predicated on the selfish hypothesis that when a city is great the rights of the rest of the world must be sacrificed to supply its needs and promote its continued growth. The State of New Jersey, and its municipal subdivisions, have an equal right to growth. Whether they now need the waters of the Delaware River for public consumption or otherwise, is beside the point. In the case of *Economy Light and Power Co.* v. *United States,* (256 U. S. 113) Mr. Justice Pitney said (p. 123);

> "* * * but a hundred years is a brief space in the life of a nation;"

Within that brief space of time there may be within the State of New Jersey municipalities, or an aggregation of municipalities, whose population and needs will be as great as that of New York City. The natural advantages which New Jersey enjoys by reason of bordering on the Delaware River must be conserved for the future needs of its people, and this court cannot undertake to regulate or promote the economic and population development of one section of the country at the expense of another. The question is not a judicial question, but purely a political question. The defendant claims necessity of the water to supply the *future* requirements of its inhabitants, yet in building the dams and flooding the areas behind them it proposes to wipe out of existence numerous thriving municipalities where thousands of people live contentedly and from choice. But that is an affair of the legislature of the State of New York. There is no law or right to impose the same fate indirectly and *in futuro* upon people who choose to live in New Jersey.

The attributes of sovereignty impose upon the plaintiff the obligation to protect its citizens from injury.

Under the Constitution it cannot go to war with New York City or State. The Constitution having deprived it of that weapon of defense, has provided another, in the form of the restraining powers of this court. Since this court cannot force two states to enter into a compact against the will of either, it cannot, by judicial decree, order the same result by undertaking to decree an equitable division of waters of an interstate stream.

Necessity is a relative and not an absolute term. If "necessity" can "*now*" be relieved by 600 million gallons daily, how long will it be before the same necessity will recur? How long will it be before the same "necessity" will require the diversion of the entire run-off of the Delaware watershed on the New York State side? Philadelphia may divert some or all of the water from the

Lehigh River watershed. A glance at the map attached to the complaint (as Exhibit "A") will show that in such case what is now the Delaware River would become a rivulet trickling among the rocks.

It is respectfully submitted that the evidence demonstrates that there is no necessity for the proposed diversion and that in any event the diversion cannot be justified on that ground.

III.

Navigation.

The proposed diversion will substantially affect the navigation in, and the navigable capacity of, the Delaware River and of the tributaries in question; and the defendant city has not complied with the conditions precedent prescribed by Congress.

The Master concluded that "there will be no unreasonable obstruction or interference with navigation or the navigable capacity of the Delaware River by reason of the execution of the Plan of the City of New York" Rep. p. 95; R. 4847).

He further continued: "I have found that the execution of the New York project would cause slight damage to navigation, * * *." (Rep. p. 193; R. 4953).

He refused to find as requested by the plaintiff that the proposed diversion will reduce the water level, that the proposed dams and diversion will create obstructions to the navigable capacity of the river and the tributaries, and will cause substantial and irreparable damage to the property of the plaintiff, and its citizens in respect to natural and artificial navigation; he further refused to find (as requested) that the question whether the proposed diversion would be injurious to navigation or im-

pair the navigable capacity of the river, should be determined solely by Congress and the Secretary of War, according to the customary procedure.

Plaintiff's Exceptions Part 3, Nos. 18-23; (R. 4986).

Navigability Below Trenton

On this point the Master found, "The Delaware River in its tidal section from its mouth to Trenton Falls is a navigable stream and is actually navigated and carries a large volume of commerce." (par. 24 of Rep. p. 203; R. 4963).

No exception has been taken to this finding, as there is no dispute that the river below Trenton is navigable water of the United States.

In 1928 the commerce on the river between Trenton and Philadelphia was over 5,000,000 tons (R. 4489); this part of the river is navigated by modern barges, some of which carry 1,000 tons and by tugs of 14-foot draft.

Up to June 30, 1929, the United States Government had spent over $1,000,000 on the channel between Trenton and Philadelphia; a 20-foot channel is now under construction at an estimated cost of $1,326,000 (R. 3655); as a condition of obtaining this depth, the City of Trenton has obligated itself to construct terminals and other equipment at a cost of $450,000 (R. 3656).

Up to the same date the United States Government had spent over $44,000,000 to improve and maintain the channel below Philadelphia.

The details of this commerce and its character and extent are set forth in Exhibit 172 (Parts of the Annual Report for 1929 of the Chief of Engineers of the United States Army).

Navigability Above Trenton

On this point the Master found:

> "The Delaware River from Trenton Falls to Hancock, New York, and beyond to undefined points in the East Branch and West Branch, was navigated during the last century and before, and carried considerable commerce. It is not now navigated for commercial purposes and is unsuited to modern methods of water transportation. The only navigation at the present time is by motor boats and canoes for pleasure purposes and for short distances. The river, however, is navigable in fact and, therefore, navigable in law under the decisions of this court." (par. 25, Rec. p. 203; R. 4963).

This finding is amply supported by the proof and is not challenged by any exception.

Effect upon flow and level.

In his Report the Master summarizes the effect of the New York plan as follows:

> "* * * I find that under the operation of the New York plan, the level of the river on an average will be lowered at Tri-State Rock during the summer period (May-October) about 1⅞ inches and during the winter period (November-April) about 3⅝ inches, and at Trenton the river will be lowered on an average about 1½ inches during the summer period and about 2⅜ inches during the winter period, and that the average annual discharge of the river at Tri-State Rock will be reduced about 14.6% to 16% and at Trenton about 8.3% and at the location of the natural oyster beds about 5%" (p. 74; R. 4825).

None of the parties has excepted to the above finding.

The following exhibits relate to this subject:

Exhibits 15 and 16 relate to stream flow (R. 31, 33). Exhibits 17, 83 and 84 show rating curves and tables (R. 33). Exhibits 18, 19, 21 and 22 show stream flow records (R. 34-45; 49-53). Exhibit 20 consists of hydrographs of

Delaware River (R. 51). Exhibits 23 to 52, are U. S. G. S. topographic maps of the Delaware drainage basin (R. 80).

Exhibit 55 is an outline map of the Delaware River drainage basin showing locations of proposed storage and power dams with a red line added showing areas included in the proposed diversion (R. 86). Exhibit 56 (six sheets), shows the drainage areas of Delaware River and tributaries (R. 101). Exhibit 57, contains index sheets showing location and drainage of stream flow records (R. 105). Exhibit 58, contains index sheets showing the names of stations and the period of rain-fall records (R. 106).

Exhibit 59 is a map of the area tributary to New York proposed reservoir in relation to gaging stations and rainfall stations (R. 114).

Exhibit 60, contains basic data of flow elevations, reservoir areas and volumes of New York proposed reservoirs, showing the actual areas above the points of diversion determined from U. S. Government maps is 616.7 square miles instead of 610 square miles as claimed by the defendant city. The combined water area of the five reservoirs is 14.96 square miles and the volume, as determined from the Government maps, is 207.1 billion gallons (R. 203).

Exhibit 61 to 66 are rain-fall records (R. 119, 131). Exhibits 67, 68, 69, 70, 89, 90 and 91 give average rain-fall on New York diversion areas and on areas above Fish's Eddy and Cook's Falls (R. 135, 352, 353, 368).

Exhibit 71 gives physiographic data which, in conjunction with the testimony, shows geological, topographical and physiographical characteristics in diversion areas (R. 145).

Exhibit 72 gives the daily yield of New York diversion areas, August, 1913, to September, 1929, inclusive (R. 161-165). Exhibit 281 (R. 2396), contains rating tables for Belvidere, Riegelsville and Trenton, supplementing Exhibit 17. Exhibit 300 (R. 4155), gives daily discharge at Trenton for year ending September 30, 1930, and flow during inspection trip (September 8-13, 1930).

Exhibit 73 (R. 168) gives the daily quantity of flow available for diversion under New York City's plan, *i. e.*, it represents the total inflow to the reservoirs less the quantity of flow released for each individual day. No other exhibit contains similar or comparable daily data.

Exhibit 74 (R. 182) shows the daily increase or decrease in flow of Delaware River immediately downstream from New York's reservoirs for the period August, 1913, to September, 1929, incl. Similar figures showing increase and decrease of flow are given in cols. 7 and 8 of Exhibit 331, but these figures relate to the yield of 540 sq. mi. only, excluding the Neversink, and are carried down to Port Jervis with an erroneous allowance for time of transit. Similar figures showing daily increase and decrease in flow under New York's plan are given in cols. 12 and 13 of Ex. 414 but these again are carried down to Trenton with the use of an erroneous time of transit. Exhibit 74 is the only exhibit in the case showing directly, and is the one which shows most accurately, the actual daily effect of diversion under New York's plan on the stream immediately downstream from the reservoirs.

Exhibit 75 (R. 186, 375) is a summary by months of Exhibits 72, 73 and 74 and gives in compact form the mean monthly flow from the diversion areas, the divertible flow, the monthly increase and decrease in flow, and the net effect of the diversion on the stream below the points of diversion under the New York plan.

Exhibit 92 gives similar data for the same period by an independent computation by Barrows but with practically identical results, covering the total yield of the diversion areas and the amounts of flow released. Data on these exhibits are comparable for the years 1913-29 with the monthly data for corresponding years on N. Y. C. Exhibit 339, since the effect of error of time of transit is largely neutralized in the monthly averages. It is to be noted, however, that all of New York and Pennsylvania's monthly summaries are given in terms of millions of gallons.

Exhibits 75 and 92 show the number of months during which no water whatever would be released from the reservoirs under the operation of the New York plan, namely, 1920, 1924, 1925, 1929, to September, five months in each year; 1915, 1916, 1918, 1922, 1923, six months in each year; 1917, 1919, 1921, 1926 and 1928, seven months in each year, and in 1927, eight months.

In other words there is an average of at least six months per year or half the time during which no water would be allowed to pass down the tributaries of Delaware River below New York's points of diversion, the statement in Exhibit 4 to the effect that the ordinary flow below the points of diversion would always be maintained, to the contrary notwithstanding.

Cols. 11 and 12 of Exhibit 75 show the maximum daily effect of the proposed New York diversion. It appears that the greatest increase in flow on a single day exceeds 200 c.f.s. on only 2 days out of 16 years, whereas the decrease in flow at various times in every year amounts to several thousand cubic feet per second. The contention in New York City's Exhibit 4 that the low water flow of Delaware River would always be increased is directly controverted by Exhibit 75, col. 14, which shows that the net result of the New York plan would be a decrease in

flow of Delaware River in every single month of the year in more than half of the years. These results are fully confirmed and verified by various independent computations given on Exhibit 92 and there are no data in the case which controvert them. In spite of differences in method of computation, New York's results are nearly the same as those shown on Exhibits 75 and 92 and these may be taken as the basic data substantially undisputed and governing the diversion effects so far as New York City's plan is concerned.

Exhibit 76 (R. 196) gives average results of the operation of the New York plan for individual years 1914-1929 incl.

This affords an opportunity to compare the average yield of the New York diversion areas as derived from different computations:

Horton	Ex. 76, 1914-29, incl.	1297 cfs.	(R. 4398)
Barrows	" 92, 1913-29, "	1291 "	(R. 591)
Merriman	" 340, 1914-29, "	1331 "	(R. 2793)

As testified by Merriman (R. 2646) and Horton (R. 4398) these results are in as good agreement as can be expected. In other words, while there is no serious disagreement as to the amount of yield of New York's diversion areas, there is a serious difference between New Jersey and New York experts as to the amount of water which New York City can or will divert from these areas. New York claims that their diversion will be 219 bill. galls. of water per year, which is equivalent to an average of 600 m. g. d. or 928 c. f. s. Using Horton's figure for the average yield of the diversion areas as 1297 c. f. s., which is the lowest figure of any, it will be seen that a diversion 600 m. g. d. amounts to about 75% of the total yield of the diversion areas. Some water is, however, required

to be passed downstream. The average amount of flow released from the reservoirs in each year is given in col. 3, Exhibit 76, and amounts to 111 c. f. s. This leaves as the flow available for diversion under New York's plan, 1,186 c. f. s., which is equivalent to very nearly 800 m. g. d. It is evident, therefore, that New York is constructing a system of reservoirs and is appropriating a drainage area sufficient to supply under New York's plan not 600 m. g. d. but approximately 800 m. g. d. if complete storage regulation is utilized, or if the conduit capacity leading from the Delaware River to Croton River drainage basin is of sufficient capacity. Here it becomes evident that the capacity of the conduit to be used in this diversion is a matter of importance. New York City has not offered a particle of testimony from which the capacity of this conduit can be checked or determined by hydraulic computations.

Exhibit 76 also shows clearly how relatively insignificant is the flow released compared with the flow available for diversion. For the period of 1914-29 the average flow released would amount to only 111 c. f. s. or roundly 75 m. g. d. as compared with an intended diversion stated at 600 m. g. d. and a possible diversion with the reservoirs and area involved of close to 800 m. g. d., or more than ten times the amount of flow released.

Cols. 5 and 6 of Exhibit 76 also show the limited extent of time in which increase of flow would result and the large proportion of the time in which the operation of New York's plan would reduce the flow, with the consequence that while there would be slight increases of flow in extreme low water, at certain times the duration of low water in Delaware River would be practically continuous. This is further brought out on Exhibit 77.

Exhibit 77 (Horton, R. 201) shows the total increase and decrease in flow in c. f. s.—days in each year and the number of days with increase and decreases, respectively. The averages are as follows:

There would be an increase of flow during an average of 57 days per year and the average increase would amount to 66 c. f. s. on those days, whereas there would be a decrease in flow 308 days per year, with an average decrease of 1,420 c. f. s. on those days.

Exhibit 78 (R. 206) shows that during the period 1914-28, incl., even during the summer season, July to October, there would be an increase of flow on an average only 40 days per season, and the average increase on those days would amount to only 81 c. f. s., whereas there would be a decrease during the four summer months, July to October, on an average of 83 days, or two-thirds of the time, and the decrease would amount to an average of 728 c. f. s. on those days. This also shows the net result of the operation under the New York plan during the summer months, July to October, inclusive, which, allowing both for increases and decreases, would be equivalent to a continuous average decrease in the flow of Delaware River below the points of diversion of 464 c. f. s. for the summer months.

Exhibit 79 (R. 210-216) shows the average monthly yield of Neversink River at Tri-State Rock. In the absence of actual gagings, the yield of Neversink River could only be determined by computation. The figures given on Exhibit 79 have neither been met nor questioned. These data, added to the gaged flow of Del. River at Port Jervis, give approximately the total yield of Delaware River at Tri-State Rock and are the only data in the case giving these results.

Exhibit 80 (R. 219) shows the average monthly yield at Tri-State Rock that for the period Oct. 1913 to Sept. 1929 is 6,560 c. f. s. or 1.92 c. s. m. from the tributary drainage area of 3,415 sq. ml.

Exhibits 93-102, incl. (R. 382-429-1965). These hydrographs, covering the years 1913-1929, show the monthly effect of operation under the New York plan with 600 m. g. d. average diversion at the outlet reservoirs and at Tri-State Rock, Belvidere, Riegelsville and Trenton, and also show the effect at these locations for the same period with a diversion under the New York plan of 800 m. g. d.

On these hydrographs the white lines on the lower diagram show the monthly flow under natural conditions, and the blackened areas the mean monthly flow after diversion, while on the upper diagram, on hydrographs, Exhibits 95-102, there is shown the monthly change in stage in feet. Black columns above the zero line represent an increase in stage due to an increase of flow of released water; black columns extending downward from the zero line represent a decrease in stage in feet due to diversion. Inasmuch as the same data are given in tabular form and are more readily comprehensible in such form, further discussion of these hydrographs is unnecessary.

Accompanying the hydrographs is a series of tables showing monthly diversion effects under the New York plan but with a diversion of 800 m. g. d. and 600 m. g. d., respectively. These tables of monthly summaries are similar to Horton's monthly summary table, Exhibit 75, but give the average monthly diversion effects not only at the reservoirs but also at Tri-State Rock, Belvidere, Riegelsville and Trenton. The average results, 1913-28, are as follows:

Tri-State Rock

With 800 m. g. d. diversion—

Flow before diversion	6,617	c. f. s.
Flow after "	5,422	
Net effect of diversion is a decrease of flow at Tri-Rock State of	1,195.	c. f. s.

With 600 m. g. d. diversion—

Flow before diversion	6,617	c. f. s.
Flow after "	5,675	
Net effect of diversion is a decrease of the average flow at Tri-State Rock of	942	c. f. s.

Owing to slight differences due to varying time of transit and different periods used in the computations, the net average effect of the diversion differs by a trivial amount at Belvidere, Riegelsville and Trenton from that at Tri-State Rock. The average results are as follows:

Belvidere

Oct. 1922, Sept. 1929, incl.

800 m. g. d. diversion.

Average flow before diversion	8,362	c. f. s.
" " after "	7,202	
Net reduction in flow	1,160	c. f. s.

600 m. g. d. diversion.

Average flow before diversion	8,362	c. f. s.
" " after "	7,452	
Net average reduction in flow	910	c. f. s.

Riegelsville

Oct. 1913-Sept. 1929.

800 m. g. d. diversion.

Average flow before diversion	11,032	c. f. s.
" " after "	9,848	
Net average decrease in flow	1,184	c. f. s.

600 m. g. d. diversion.

Average flow before diversion	11,032	c. f. s.
" " after "	10,105	
Net average decrease in flow	927	c. f. s.

Trenton

Oct. 1913-Sept. 1929.

800 m. g. d. diversion.

Average flow before diversion	11,205	c. f. s.
" " after "	10,021	
Net average decrease in flow	1,184	c. f. s.

600 m. g. d. diversion.

Average flow before diversion	11,205	c. f. s.
" " after "	10,278	
Net average decrease in flow	927	c. f. s.

These tables also show the insignificance of the increase in flow under the New York plan when average over the entire year. These average increases are, of course, the same for either 600 or 800 m. g. d. diversion, since the released flow would be the same, and are as follows:

Average yearly increase of flow—

Tri-State Rock	1913-29	5	c. f. s.
Belvidere	1922-29	8	
Riegelsville	1913-29	6	
Trenton	1913-29	6	

If the total increase is averaged over the entire year it is equivalent to but 6 or 8 c. f. s., whereas the decrease resulting from a diversion of 600 m. g. d. amounts to 927

c. f. s. The increase in flow at times when the increase occurs is equivalent to less than 1% of the decrease in flow at times when a decrease occurs.

Exhibit 103 (R. 430) is supplemental to the hydrographs, Exhibits 95-102, and to the accompanying tables in that it shows in tabular form the effects of New York's proposed diversion on the stage of Delaware River at Tri-State Rock, Belvidere, Riegelsville and Trenton. This table shows the average change of stage resulting from diversions of 600 m. g. d. and 800 m. g. d., respectively. Taking figures for 600 m. g. d. diversion it appears that on the average the stage of the river at Tri-State Rock would be decreased .23 ft. or 2¾ in. for the year and would be decreased .16 ft. or roundly 2 in. in the summer season, May to October. In other words, the net effect of the New York diversion under its plan of release would be a decrease instead of an increase in the depth and stage of Delaware River at Tri-State Rock during the summer months. In individual months the effect is much greater than the average. The greatest monthly decrease in stage at Tri-State Rock would be .7 ft. or 8⅜ in. It cannot be disputed that a diversion which reduces the stage of the river during the mid-summer season by approximately 9 in. for an entire month would be seriously detrimental to the use of the stream for boating, recreational and other purposes. Of course during certain months there is an increase of stage due to released flow but the greatest increase of stage at Tri-State Rock on any month is .1 ft. or 1¼ in. as compared with a decrease seven times as great. Similar results would follow New York's diversion at other locations, as will be seen from the following brief summary from Exhibit 103, with 600 m. g. d. diversion:

Belvidere—for the summer season, May to Oct., the average effect would be a decrease of .19 ft. or 2¼ in.

Riegelsville, .18 ft. decrease or 2½ in.

Trenton, .12 ft. or 1½ in.

For the year the average result would be a decrease of stage at Belvidere of .27 ft. or 3⅛ in., at Riegelsville, .27 ft. or 3¼ in., at Trenton, .16ft. or 1⅞ in. The maximum decrease in stage would be much greater, as follows:

Belvidere, .65 ft. or 7⅞ in.

Riegelsville, .8 ft. or 9⅝ in.

Trenton .48 ft or 5¾ in.

These figures show that throughout the entire length of the river from Tri-State Rock to Trenton there would be at times a decrease in stage ranging from ½ ft. to nearly 10 inches throughout the entire month. With 800 m. g. d. diversion the decreases would be proportionately greater.

Exhibit 111 (R. 636) is a table based on New York's own table, Appendix A, p. 19 of Exhibit 4, and shows that at times of minimum flow at Port Jervis, as set up in Exhibit 4, the increase of flow due to release under New York's plan would be on the average about one-half as great as claimed by New York City. This relates to conditions on the minimum or lowest day of each of a series of years—just the time when New York City claims that operation of her plan would be most potent in increasing the low-water flow of the stream.

(R. 1038, 1051),

Exhibits 173 and 174 show respectively, the average lowering of the tidal section of Delaware River as a result of New York's diversion at low tide and high tide. The figures given are for the different months of the year, arranged in order of average flow from the lowest to the highest.

For the month of lowest flow the operation of New York's plan would reduce the tidal stage below Trenton an average of 0.68 ft., while for the month of highest flow the reduction of water level or decrease in navigable depth

at low tide would be 0.55 ft. Similarly at high tide, in the driest month of the year, from Exhibit 174, the average reduction in navigable depth would be 0.034 ft. and for the wettest month of the year, 0.225 ft. These are monthly averages and show that in spite of the releases provided under New York's plan there would be an appreciable decrease in the navigable depth in the tidal section of the river below Trenton on an average for every month of the navigation season.

The detrimental effects of the operation of New York's plan on navigable depth below Trenton are best revealed by consideration of reduction in flow and navigable depth for individual periods, as shown on Horton's rebuttal Exhibits, Nos. 300-N and 300-O.

Exhibit 175, in diagrammatic form, shows the relation of quantity of fresh-water inflow to the tidal section of Delaware River at Trenton to the navigable depth. This diagram forms the basis of Horton's Exhibits 300-N and 300-O.

Summarized briefly, Exhibit 175 shows that at low and medium stages of Delaware River a reduction of flow of 600 m. g. d. or 928 c. f. s. will decrease the navigable depth of Delaware River by 0.2 ft. at low stage, somewhat over 0.1 ft. at mean stage and about 0.07 ft. at high stage or high tide.

Exhibits 278-279 (R. 2384) are rating curve and rating tables showing relation of discharge to stage of Delaware River at Tri-State Rock. This forms the basis of determination of effect of diversion on stage of the stream. Exhibits 278 and 279 are large-scale drawing and tabular equivalents of Exhibit 86.

Exhibit 280 (R. 2394) is a table of change in stage at various points due to New York's proposed diversion, giving the figures which appear on the hydrographs, Exhibits 92-105, incl.

In addition to the foregoing proof as to quantitative effect of the diversion in feet and in inches, there is other proof showing the amount of the diversion in percentages of the natural flow of the river.

In Exhibit 4, page 16, Merriman states that the diversion of the 600 m. g. d. will reduce the flood flows of the river (that is all flow above .45 c. s. m.) at Tri-State Rock, by about 17%. In Exhibit 351, in a letter dated October 15, 1929, from the President of the Board of Water Supply of the defendant city to Colonel Pillsbury, it is stated on page 3, as follows:

> "In such cases the plan will operate to reduce the flow at Port Jervis in the ratio which the drainage area developed bears to the total drainage area at Port Jervis, namely: 610/3070 = 20%, * * *."

On page 4 of the same letter it is stated that during the months of July, August, September and October the flow at Port Jervis, including the constant release of .45 c. s. m., will be reduced from zero, when the flow is .45 c. s. m., to 10% when the flow is 90 c. s. m. and that during the same months, except when the flow is less than .45 c. s. m., the flow at Port Jervis will be reduced by 20%. Page 5 of the same letter states that during the other eight months of the year, when the flow is .45 c. s. m. or above, the reduction in the flow of the river will be 20%. On page 7 it states that the plan will never reduce the flow at Trenton Falls by more than 9%.

In describing his Exhibit 332, Merriman testified that for the year 1905 the reduction in flow under the New York plan would have been 18% (R. 2724), of the total, and for the year 1918, a little over 19% (R. 2724). He also testified that the figures in Appendix "A" on page 19 of Exhibit 4 showed a diversion of about 20% of the total for most of the years (R. 2725). His Exhibit 332 shows that for January, 1905, the decrease on the stream flow is 100% of the entire flow (R. 2730). Merriman

also testified that from his Exhibit 333, which is a summary of his figures of Exhibit 332, the percentage of the decrease in annual flow can be determined (R. 2732). His recollection is that the effect of the proposed diversion would reduce the water level in the tidal section at Trenton at low tide by ½ inch. (R. 2736). His Exhibit 333 shows that the average annual reduction of flow at Port Jervis would be 14.5%; at Tri-State Rock, 14.6% (R. 2787); at Riegelsville 8.7%; at Trenton 8.3%; and at the Delaware state line 5.4% (R. 2788). In comparing his figures with those of Professor Barrows, Mr. Merriman said that the differences can be reconciled on the theory that his figures covered a somewhat longer period than, and were obtained by slightly different methods from, these used by Barrows. He explains the difference between his testimony as to the percentage of diversion effect, and the 17% at Tri-State Rock and the 10% at Riegelsville, as shown in Exhibit 4, page 16, by stating that the figures given in his testimony were made on the basis of the gage at Fish's Eddy Station which indicates a somewhat higher discharge from the upper regions of the diversion area (R. 2802).

In the table which accompanied Professor Barrows' hydrographs (R. 1965) Column 2 of Sheet 6 shows the average annual flow at Tri-State Rock before diversion, and Column 6 on the same sheet shows the average flow after diversion, of 600 m. g. d. The difference between these two figures, namely, 942 cubic feet per second is equal to 14.2% of the natural flow.

In passing let us note that the entire average annual flows of the Arkansas River, involved in *Kansas* v. *Colorado* (206 U. S. 46, 116), were 1890, 837 c. f. s.; 1895, 835.5 c. f. s.; and 1900, 816.08 c. f. s. In other words the amount of flow which defendant city proposes to divert each and every year is greater than the entire average annual flow of the Arkansas River.

Exhibit 96 shows that the New York plan will take 72% of the annual run-off of the diversion area (R. 398), and

that, for the whole period covered by that exhibit, the proposed diversion of 600 m. g. d. produces an average decrease of 16% in the flow of the river at Tri-State Rock (R. 407).

Exhibit 97 shows that the proposed diversion will reduce the flow at Belvidere 11½% (R. 422); at Riegelsville 8.3% (R. 424); and at Trenton 8.2% (R. 427).

Effect Upon Navigation.

In addition to the findings of the Master on this point, above mentioned, he concluded:

> "The record herein discloses that the carrying out of the New York plan will have slight effect and no materially adverse effect on the navigation and navigable capacity of the tidal and non-tidal sections of the Delaware River" (par. 27, Rep. p. 203; R. 4964).

His conclusion is based chiefly upon the testimony of General Pillsbury (Rep. pp. 91-94; R. 4844-4846).

With the highest respect for General Pillsbury, it is necessary to observe that his qualifications disclose no knowledge of or experience in, the matter of navigation. Fortifications, troops, mathematics professor, officers school, district engineer, all come in their turn (R. 3640). It is the civil engineering officers of the Department who stay with the work and actually handle the projects in the field.

One statement of the witness is sufficient to demonstrate a lack of knowledge of navigation. He stated that the decreases in water level, which he admitted would result from the New York plan, would not, in his opinion, adversely affect navigation because the vessels would be loaded to meet the conditions that they can assuredly count on (R. 3646). In the first place this statement assumes a reduction in load to meet the changed condition; that is our point, as Barnes testified. In the second place the witness

assumes that vessels load to meet minimum low tide conditions. If that was true, most of the prosperous maritime ports of the north Atlantic coast would never have existed. We have seen a British gunboat resplendent with decorations to celebrate a visit of the Provincial Governor, ignominously stranded in the harbor of St. John, New Brunswick, while teams of horses and wagons were driving entirely around it on bare ground at low tide. Not a dock in the city was within fifty feet of the water's edge at low tide, yet from the great elevators located on the docks, ocean liners carry cargoes of Canadian grain to British and European ports. High tide is everything to that and thousands of other ports. The ocean liners sailing from the port of New York sail on the tide, regardless of the hour of the day or night. The largest tug operating on the Delaware River between Philadelphia and Trenton has 14 foot draft; the smallest, 11 foot draft (R. 4490). The controlling low tide depth as last reported by the War Department was 8.3 feet (R. 4489). How could either of these tugs operate if it relied solely upon low tide minimum navigable depths?

The official "Coast Pilot" issued by the United States Department of Commerce describes the channel from Philadelphia as having a 12-foot project depth, and then says "there is considerable trade on the river in steamers, schooners and barges up to 14-foot draft, to industrial plants along the shores."

It seems justifiable here to say a word about the qualifications of the witnesses who differed with the opinions of General Pillsbury. We will therefore discuss briefly those of their qualifications which relate strictly to the subject of navigation.

Mr. Barnes, until his death, recently, was recognized as one of the leading navigation engineers in the United States. He was employed by the War Department in 1892 on the construction of Poe Lock at Saulte Ste. Marie,

Michigan (R. 853). He was also employed by the War Department on a canal survey on the Black Warrior River near Birmingham, Alabama; also by the same department on surveys for canal and waterways joining the Great Lakes with the Atlantic between the St. Lawrence River and Lake Champlain. In 1898 he was transferred by the War Department to the design and construction of the Hennepuin Canal between the Illinois and Mississippi Rivers near Rock Island where he worked for six years. In 1905 he designed the locks built in the Mississippi River, opposite Moline. Later he had charge of the design of the structures in the Panama Canal (R. 853). In 1907 he was appointed by Governor Hughes as consulting engineer on the construction of the New York Barge Canal where he continued until 1915 (R. 854). In 1917 he was appointed Chief Engineer of the Division of Waters of the State of Illinois and in that capacity had charge of the designs for the Illinois Waterway and had charge of all other waters in the state for navigation and other purposes. He continued in that work for approximately ten years (R. 855).

Mr. Horton's experience as shown by his qualifications includes the following: Investigation of a ship canal for the United States War Department in 1898 (R. 64), engineer in charge of the hydraulic features of the design and construction of the New York State Barge Canal, 1906 to 1911 (R. 67). He has made a particular study of the navigation aspects of the Delaware River for the past four years (R. 4457).

Mr. Sherman as Assistant Chief Engineer of the Sanitary District of Chicago designed the Northshore Channel connecting with the main drainage canal of Chicago and also the Calumet Sag Channel. From 1913 to 1916, inclusive, he was a member of the Illinois State Rivers and Lakes Commission where, as commissioner, he had charge of various phases of maintenance and operation of rivers

and lakes, including flood protection and public hearings on applications for removal of obstructions in the river channels (R. 600). He wrote several bulletins connected with navigation which remain official documents in the State of Illinois. He was also a member of the Illinois Waterway Board of Engineers and made a report on the improvement of the Illinois River for navigation, etc. (R. 601).

Mr. Sabin was United States Assistant Engineer on the construction of the Poe Lock, referred to by Mr. Barnes, at Saulte Ste. Marie, Michigan. In 1896 he made measurements of the discharge of St. Mary's River and computations on the effect on water levels of obstructions in the stream. In 1898 he measured the base line at Galveston, Texas, for the United States War Department. From 1899 to 1902, he was Assistant Engineer of the United States Lake Survey of the War Department, including discharge measurement on St. Claire River and computation of effect of diversions of water, and other hydrographic surveys. In 1903 and 1904 he was United States Assistant Engineer on designs of movable dams for canal control on Saulte Ste. Marie (R. 4487). In 1905 and 1906 he was Secretary of the American Section of the International Waterways Commission, making studies on the regulations of Lake Erie and other hydrographic questions pertaining to the Great Lakes, including the effect on lake levels of power development on Saulte Ste. Marie, and of the Chicago Sanitary District diversion. From 1906 to 1925 he was Superintendent of the St. Mary's Falls Canal, Saulte Ste. Marie, Michigan, under the War Department, involving the construction of head races and tail-races, navigation channel, regulating works for control of the level of Lake Superior, design and construction of movable dams and a new navigation dam with two locks. From 1925 to date he has been Vice-President of the Lake Carriers Association at Cleveland with duties which include studies of the channel and harbor improvements of

the Great Lakes and the regulation of the draft permissible for navigation. He was a witness for the complainant in *Wisconsin* v. *Illinois* involving the question of the effect of the Chicago diversion upon the navigable capacity on the Great Lakes (R. 4488). He made an examination of the Delaware River and navigation conditions thereon in the tidal reach at and immediately below Trenton and on the basis of that investigation and experience above described he has given his testimony (R. 4489).

Having stated the qualifications of the several witnesses who testified on this point in behalf of the plaintiff, we now briefly summarize their testimony, as follows:

Mr. Barnes testified that the Chicago drainage case involved the lowering of lake levels from 4½ to 6 inches. The effects of lowering the levels in the tidal sections at Trenton by the proposed New York diversion would be, first: It would decrease the tonnage capacity of the vessels plying between Trenton and Philadelphia. It would decrease the capacity of the load several tons, depending on the size of the vessel. For a 2,000 ton vessel it might decrease the load as much as 60 tons (R. 1052). For larger vessels the decrease would be greater. The limit of the carrying capacity of all vessels is the depth of the channel, and there is a further effect that, if this lowering is as much as three inches or six or eight inches as shown on Exhibit 175, it would affect improvements all along the tidal section from Trenton down. It would also affect the proposed intercoastal canal between Delaware River and New York Bay. It would increase the hazards that might follow the construction of that canal (R. 1052).

Horton: Does not agree with the conclusions of General Pillsbury about the effect of the New York Plan on navigation in the tidal section. It merely represents an approximation. Horton has been studying this matter for a period of four years (R. 4457). While the present navigable channel as far as Trenton has a project depth of 12

feet, it has in fact depths ranging from 8½ to 10 feet (R. 4458). Project depths are not as a rule identical with actual navigable depths nor is the navigable depth uniform. Boats are not limited in their draft by the project depth. The boats would be lower down in the stream by the amount stated in Exhibits 300-N and 300-O (R. 4459). Navigation is entitled to the benefit of all the depths provided by nature or by improvements without regard to what the depth is. If the navigable depth is reduced, it reduces the navigable capacity of the channel, whether it reduces the depth below the project depth or not (R. 4423). The establishment of a project depth of 12 feet does not limit navigation to that depth. The stream under natural conditions during the greater part of that time is above that stage, and navigation can then utilize, and profit by, both the natural depth and the project depth (R. 4462). If the channel depth is insufficient and any cause lowers the river or natural conditions which permit boats to come at both high and low tide, then the navigable capacity is cut down (R. 4462). They may get only 50% of operation out of the channel because of that restriction on the time limit and navigable capacity (R. 4462). He does not agree with General Pillsbury that there would be no injury to navigation. The figures on Exhibit 300-N show how much the navigable depth would be reduced even if the project depth was maintained (R. 4465).

Sherman testified that in order to provide the twenty-foot channel in accordance with the project now in the process of execution, between Trenton and Philadelphia, after reduction of water levels caused by New York diversion as shown on Exhibit 175, it would be necessary to dredge an additional wedge of land 200 feet wide, 30 miles long, to a depth beginning with seven inches at Trenton and tapering to nothing at Philadelphia (R. 4096). This would require the removal of 964,000 cubic yards which at the present price of 60c a yard would cost $578,400. Adding to that the additional amount of excavation for the

wider portions on the curves, the cost of this excavation would reach $600,000. That represents the actual difference in cost of a twenty-foot project depth before and after diversion (R. 4096) and this was not controverted.

It appears that a channel that was dredged to a project depth of 12 feet has filled up to a present depth of only 8.3 feet (R. 4489). The 20-foot channel will do the same; perhaps faster and more, on account of its lower bed level. The loss of six inches by diversion must always be added to such loss of depth. Since the City of Trenton has obligated itself to spend $450,000 to obtain an increase of eight feet in project depth (S. M. 6060), some of the value of that expenditure will be lost by the proposed diversion. Computed according to Horton's data (R. 4422), that loss will be $10,438, which Trenton will be required to spend uselessly. In addition to that, if vessels must load lighter to meet that changed condition in navigability, there will be a constant daily loss of tonnage capacity for every vessel using those facilities.

Mr. Sabin studied navigation conditions on the Delaware River at and below Trenton (R. 4489). He found that the traffic between Trenton and Philadelphia represented 25% of the traffic at and below Philadelphia. That between Trenton and Philadelphia modern barges, 130 feet long and 35 feet wide, are operated with the capacity of 1,000 tons, towed in fleets of six to eighteen, and sometimes twenty-eight barges, drawing from 1½ to 2 feet when light, to from 10 to 10½ feet when loaded. They are hauled by tugs, the largest of which is of 14-foot draft and the smallest of 11-foot draft (R. 4490). He testified to his experience with navigation on the Great Lakes and, in particular, with regard to the effect of the lowering of the lakes 6 inches by the diversion of the Chicago Drainage Canal. He expressed the opinion that 6 inches lowering in the water-levels in the Delaware River was the same as on the Great Lakes. The extent of the effect

would depend upon the amount of the traffic (R. 4491). Six inches to a 10,000-ton vessel on the Great Lakes is one thing, six inches to a 1,000-ton barge on the Delaware is another thing, but relatively the principle is the same (R. 4492). In a general way with most of General Pillsbury's statements, Mr. Sabin has no reason to disagree. The General makes certain statements in regard to the effect of diversion upon the river which this witness believes are in accordance with the testimony in the case. There are some things, however, in General Pillsbury's testimony which this witness thinks might be misunderstood. He does not agree with the application the General makes of the facts in reaching his conclusion, and he does not agree with that conclusion. The General's statement is possibly correct if properly interpreted (R. 4492). The way the statement reads in the record Mr. Sabin does not think it is true. He thinks General Pillsbury refers to the operation of the plan, taking monthly means of stages and discharges (R. 4493). General Pillsbury's statement is true as a matter of averages, but not in detail results. General Pillsbury was talking about averages and his statement would be true if it said "at higher discharges, when the low level is from one to seven feet above minimum low water, diversions may decrease the elevation at low tide by as much as half a foot and at high tide by as much as two-tenths of a foot." With regard to General Pillsbury's statement that such small differences as the proposed diversion would produce are below the accuracy obtainable in dredging and surveying the channel and are far beyond the practical utilization of the channel for navigation, Mr. Sabin says they are below the accuracy of dredging to this extent, that in running a dredge, either a pump dredge or a dipper dredge, some parts of the bottom will be more than six inches lower than other parts, but the point that governs is the highest point that is left by the dredge, and if that is six inches higher than the project calls for, for the depth desired, it is certainly of

very great importance to shipping, whatever kind of shipping it is, or whether it is on the Great Lakes or the Delaware River or anywhere else (R. 4494).

House Document 228, which authorizes the twenty-foot channel, gives the estimates of cost for deepening to twenty feet, eighteen feet and sixteen feet. The cost of deepening to twenty feet is $461,000 more than the cost of deepening to eighteen feet. If the difference of two feet cost $461,000 a difference of six inches would be one-quarter of that, and a difference of three inches would be $57,625. As this is the first cost of the channel, if six inches, or three inches, were of no importance, those amounts could be saved.

The Chief of Engineers who made that report says it is advisable to make a twenty-foot channel, and if it was not important to make it fully twenty feet, and it was only necessary to make it nineteen and three-quarters feet, they could have saved $51,000 (R. 4495). Mr. Sabin does not agree with General Pillsbury's conclusions that navigation on the river will not be affected by the diversion, changing the water level as much as six inches. He thinks that possibly all of the traffic that is now going can be carried on the lower draft, but it will be at an increased cost (R. 4495). Regarding General Pillsbury's statement that those high stages occur for but brief periods of time and the diminution of as much as half a foot on those stages would not in his opinion adversely affect navigation, Mr. Sabin says that any of those reductions in navigable depth are obstructive to navigation not only with regard to the depth which can be loaded because of that reduction, but also with regard to the length of time that vessels would have to wait for a higher tide in order to operate even under depths which are below the maximum but above the mean depth of tide (R. 4497). Assuming that vessels would load to meet the new conditions as stated by General Pillsbury, Mr. Sabin says that those

conditions would be more onerous than they would be if they were sure of six inches more water. To the extent that there would be a change in the weight of loading to meet these conditions as stated by General Pillsbury, the navigable capacity of the river would be adversely affected (R. 4497). Whether the diversion would be more or less injurious with a twenty-foot channel than it would be with a twelve-foot channel, would depend upon the extent of the commerce. If the commerce remained the same the effect of the diversion would be less, but the purpose of a twenty-foot channel is to accommodate heavier drafts of commerce. The new channel will permit vessels of drafts as much as twenty-four feet to come to Trenton at high tide, and the extra six inches might be the determining factor governing the operation. To a vessel of twenty-four feet draft, six inches would mean definitely more in tonnage than to a vessel of twelve feet draft (R. 4498). A twenty-foot channel is not built for the present traffic on the river (R. 4502). As the Special Master observed, nobody questions that the deepening of the channel from twelve to twenty feet is for the purpose of deeper draft vessels to operate (R. 4498). The reports of the Chief of Engineers of the War Department, produced by Mr. Sabin, show that the commerce on the river has increased during the past ten years (R. 4502, 4490) and that within the area of the project depth of twelve feet in the river there were actually controlling navigable depths as follows: 1925, 10.5 feet; 1926, 10.4 feet; 1927, 10 feet; 1928, 8.3 feet (R. 4489).

Testimony of Boat Captains.

Having completed the discussion of the testimony of experts on the question of the effect of proposed diversion upon navigable capacity of the tidal section of the river, let us consider the testimony of captains of tug boats who actually navigate the river and who gave their

actual experience, and opinions based thereon, of the importance of six inches difference in the water levels.

Captain Joseph H. McIntyre is a tug boat captain who has operated a tug boat between Trenton and Philadelphia for the past four years, and has operated on the Delaware River for 45 years. His present boat has a ten foot draft (R. 796). He tows barges of merchandise of all kinds (R. 797). During the past two years he has had trouble in operating the boat, once in a while in low tide in the fall of the year and summer, generally in August and November. The boat touches bottom once or twice a month, according to the height of the tide in the channel, which now has a project depth of twelve feet (R. 797). He has touched bottom at Bordentown (R. 798). Passenger boats are operated in the summer time on Sunday. If the water at low tide was lowered six inches his boat would drag. He could not make time and would have to go slow. The boat sucks down when running at full speed ahead, increasing the draft from ten inches to a foot. Sometimes he can get over a bar by reducing speed and sometimes not (R. 798).

Captain Clarence Chamberlain is a master pilot on the Delaware, employed by the Warner Company operating sand and gravel boats and barges. His boat has a draft of fourteen feet and operates between Fieldsboro (near Bordentown) and Philadelphia, where the project depth of the river is twelve feet (R. 803). He goes and comes when the tide is up. Project depth means twelve feet at low tide. In the spring time there is a good flow of water coming down the river. It backs up the flood tides above Trenton and gives a good draft. They have no trouble then. The natural flow of the river in the spring benefits navigation. Three inches less depth at any time of year would affect navigation. He operates as close as three inches from the bottom, and closer than that. They actually drag very hard in some places. Anything like three

inches or more in lowering the water would affect the navigation. Abreast of Roebling and just below Fieldsboro there is about twelve feet at low tide (R. 802). He has to have the tide up to a certain stage to get over that. In the Fall of the year the tide is about five feet and around three-and-one-half to four feet in the spring (April). Three inches lower water would affect navigation even in the flood tide, because they go into other plants outside the channel. They operate to eight or nine different places which requires the top of the tide to be reached. He cannot get in and out on the fall of the tide in the fall of the year, from the first of July to the latter part of December (R. 804). He has trouble in November and December, as well as in the summer time. He has to have other tugs go into the places sometimes to get the barges out. The tide falls off during the summer and fall, requiring the use of tugs of less draft. The tide runs lower by two feet during the summer and fall than during the spring. His boat does not get caught on every tide because tides vary with winds and sometimes heavy rains up the river improve the conditions. Smaller tugs are used only in emergencies during very low tides (R. 805). The quantity of flow in the river makes a difference to his situation at Fieldsboro (R. 805).

Captain Ebe J. Holt (R. 829) for nine and one-half years, up to about four years ago, operated a boat on the river every day. He was captain of the steamer "Dalton" and the steamer "Springfield" operating between Philadelphia and Trenton. He had trouble in getting sufficient water at low tide at Trenton. At a number of places between Trenton and Philadelphia in the summer time at low tide the channel is very low, particularly at certain points above Bordentown (R. 829). Also at Trenton docks sometimes in the fall. The draft of his boat was nine and one-half feet and the project depth was twelve feet. Three inches lower water would positively make a difference and

a greater lowering would make a greater difference, accordingly (R. 830).

This is the testimony of men who actually navigated the boats. It is the strongest kind of proof and stands uncontradicted.

The only witnesses on navigation produced by any other party to the suit were Colonel Kutz (R. 2477) and Mr. Finch (R. 2974). Their testimony was confined to the Barnes proposal for the improvement of navigation above Trenton. The record therefore stands with the testimony of plaintiff's witnesses on the effect of the proposed diversion on the navigable capacity of the tidal section of Delaware River unquestioned or uncontradicted except to the extent that General Pillsbury's testimony may have that effect.

Statutory Provisions.

By act of Congress (commonly known as the "River and Harbor Act") approved March 3, 1899, it is provided:

> "Sec. 401. It shall not be lawful to construct or commence the construction of any * * * dam * * * in any * * * navigable river, or any other navigable water of the United States until the consent of Congress to the building of such structures shall have been obtained and until the plans for the same shall have been submitted to and approved by the Chief of Engineers and by the Secretary of War" (Title 33, U. S. C. A. p. 377).
>
> "Sec. 403. The creation of any obstruction not affirmatively authorized by Congress, to the navigable capacity of any of the waters of the United States is hereby prohibited; and it shall not be lawful to build or commence the building of any * * * structures in any * * * navigable river, or other water of the United States, * * * except on plans recommended by the Chief of Engineers and authorized by the Secretary of War; and it shall not be lawful to excavate or fill or in any manner to alter or modify the course, * * * condition or capacity

> * * * or * * * channel of any navigable water of the United States, unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of War prior to beginning of the same." (Title 33, U. S. C. A., p. 397.)

This Court has held that the River and Harbor Act of 1899 applies to dams erected in, and waters diverted from, interstate streams above the navigable portions thereof.

In *United States* v. *Rio Grande Dam & Irrigation Company*, 174 U. S. 690, this court considered on appeal a suit brought by the Attorney General of the United States to restrain the construction of a dam in the Rio Grande River in New Mexico and the appropriation of the waters thereof for irrigation purposes. The defendants claimed the right because the site of the dam was wholly within the territory of New Mexico and because they intended to impound and divert and exercise the right to divert "the excess storm and flood waters thereof now unappropriated, useless and which go to waste." The answer denied that the river was susceptible of navigation at the point of the erection of the proposed dam. The government contended that the dam would obstruct the navigability of the river below the dam. The case was set down for argument on the pleadings on a motion of the government challenging the sufficiency of the defense. The court below held that the river was not navigable within the limits of the territory of New Mexico and dismissed the bill for want of equity.

It was contended that because the Rio Grande River was not navigable at the point where the dam was to be constructed the act of Congress had no application to that location. But this court held (p. 708):

> "The language is general and must be given full scope. It is not a prohibition of any obstruction to navigation but any obstruction to the navigable capacity, and anything wherever done or however

> done within the limits of the jurisdiction of the United States which tends to destroy the navigable capacity of one of the navigable waters of the United States, is within the terms of the prohibition. Evidently Congress, perceiving that the time had come when the growing interests of commerce required that the navigable waters of the United States should be subjected to the direct control of the national government, and that nothing should be done by any state tending to destroy that navigability without the explicit assent of the national government, enacted the statute in question. And it would be to improperly ignore the scope of this language to limit it to acts done within the very limits of the navigation of a navigable stream."

The decision in the last mentioned case was based upon Section 10 of the Act of September 19, 1890 (c. 907, Section 10, 26 Stat. 454), the first sentence of which is the same as the first sentence of Section 403 (Title 33, U. S. C. A., p. 397) above quoted except that where the act of 1890 required that an obstruction be affirmatively authorized by *law*, the Act of 1899 (c. 425, Section 10, 30 Stat. 115, now Section 403 above quoted), substituted the word *Congress*.

The purpose of this change, as explained in *Hubbard* v. *Fort*, 188 Fed. Rep. 987, 997, was that in *United States* v. *Bellington Bay Boom Co.*, 176 U. S. 211, this court decided, contrary to the contention of the government, that the word *law* included state laws as well as federal laws. Congress thereupon amended the act to require the authority of a federal law, regardless of any authority under state law.

The remainder of that section as it appeared in the Act of 1890, related to the continuance of existing obstructions. By the Act of 1899 Congress enlarged its provisions by adding all of the foregoing quotation from Section 403 (as it now is in the United States Code) after the semi-colon in the fourth line of that quotation. This new

portion provides that in addition to the affirmative authority of Congress it is now necessary to have the plans for the structure recommended by the Chief of Engineers and authorized by the Secretary of War, and also it is made unlawful to excavate or fill or alter or modify the course, condition, capacity or channel of any navigable water unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of War prior to its commencement.

Section 7 of the Act of 1890, re-enacted as Section 9 of the Act of 1899 and now Section 401 (Title 33, U. S. C. A. p. 377), has also been changed since the case of *United States* v. *Rio Grande D. & I. Co.* was decided by requiring the consent of Congress, instead of the permission of the Secretary of War to the building of any dam or obstruction in any navigable waters of the United States.

Since the *Rio Grande* case was decided Congress has therefore strengthened the act, in the following particulars:

(a) by requiring the consent of Congress, instead of by the Secretary of War.

(b) by applying the prohibition not only to navigable portions of streams but also to non-navigable portions thereof.

(c) by extending the act to apply to structures affecting the navigable capacity, as well as the navigability, of streams.

(d) by requiring the affirmative authority of Congress, regardless of state authority.

In *Hubbard* v. *Fort* (188 Fed. 987, 995) Judge Rellstab held as follows:

> "It will be noted that this section applies to all navigable waters of the United States; that it does not embrace all the structures and works embraced by Section 7 of the earlier act, but is limited to

> bridges, dams, dikes, and causeways; and that the construction of these are prohibited without the consent of Congress, except such as cross waters the navigable portions of which are wholly within the limits of a single state, and which are to be built by state legislative authority. Congressional consent to the building of such structures in all other navigable waters is still necessary by this section. Nor, as contended by complainants, does section 10 of the 1899 act apply only to interstate waters. There is nothing in this section that restricts it to interstate waters. The first part which prohibits 'the creation of any obstruction not affirmatively authorized by Congress to the navigable capacity of any of the waters of the United States' not only comprehends the kind of structures specifically referred to by section 9 but all others that may be an obstruction to the navigable capacity of the waters of the United States, regardless of whether they are interstate or intrastate."

We accordingly submit that under this statute it is the prerogative of Congress to give its consent to the construction of dams in navigable waters of the United States and that when such construction has not been affirmatively authorized by Congress, no such structure can be built except after a *hearing* before the Chief of Engineers and the Secretary of War. In other words, that authority is given in the first instance to the Secretary of War or the Chief of Engineers to decide whether a proposed construction will substantially impair the navigable capacity.

What has been attempted in this case by the City of New York is to obtain a decision in advance from this Court that the proposed construction will not substantially affect the navigable capacity of the river; this anticipates the decision of the War Department on that very subject and to that extent is an attempt to persuade this Court to usurp the powers either of Congress or of the administrative department of the government.

The recommendation in the proposed decree that it is to be "without prejudice" to the United States and subject to the paramount authority of Congress in respect to navigation, etc. (par. 8 Rep. p. 211; R. 4972), does not meet this objection, as Congress already has paramount authority in respect to navigation and navigable waters of the United States.

In the present case all that has been done by the City is to send a letter to General Pillsbury (then *District Engineer* at Philadelphia—R. 3640), enclosing the report and plan of the City; no application was made for a permit for any of the proposed structures (R. 3660).

This letter and subsequent correspondence is in evidence as Exhibit 351 (R. 3072). The City has never asked for a hearing and no hearing has ever been given to the plaintiff by or before the Department which is authorized to pass on the very question which the City seeks to have this Court pass upon in advance of its submission to that Department.

With respect to the proposed diversion of waters by the Metropolitan District of Boston from the Ware and Swift Rivers, tributaries in Massachusetts, of the Connecticut River, where it was proposed to take 205 million gallons per day from a drainage area representing only 2.93 per cent. of the Connecticut River watershed above the Connecticut state line, it was deemed necessary to apply to the Secretary of War for a permit. The Secretary of War reduced the proposed diversion to 191 million gallons per day or 2% of the average annual flow of the river to the Connecticut state line. His permit limited the diversion from the Ware River to "flood waters" in excess of 85 m. g. d. and limited the time of taking to between October 15 and June 15 of each year. He limited the diversion from the Swift River to water in excess of 20 m. g. d. with a requirement of a 71 m. g. d. release between June 1st and November 30th of each year when the flow at

Sunderland dropped to 4650 c. f. s. or less, and releases of 70 c. f. s. when the flow at that point was between 4650 and 4900 c. f. s. *Connecticut* v. *Massachusetts* (9 Adv. Op. (1930 Term), 297, 300).

The Connecticut River between Hartford and Long Island Sound had a project depth of 10 feet, with an authorized but uncompleted project depth of 12 feet. The aggregate river commerce of the Connecticut River to and from Hartford in 1927 was 592,922 tons (*Conn.* v. *Mass.* R. 666, 668).

The Delaware River between Trenton and Philadelphia has a project depth of 12 feet, and a project depth of 20 feet is now in progress of construction (R. 3655). The aggregate river commerce to and from Trenton in 1928 was over 5 million tons (R. 4489).

If it was necessary for the Secretary of War, acting in the interest of navigation on the Connecticut River, to impose these restrictions upon the proposed diversion, from 2.93% of the watershed, of 2% of the annual average flow at the Connecticut state line, it is reasonable to suppose that he should at least have the right to exercise his official judgment concerning the effect of the diversion of 75% of all the water from 610 square miles of the watershed, amounting to 16% of the entire average annual flow, upon the very much larger navigation use of the Delaware River.

The unofficial opinion of a District Engineer who is not even mentioned in the statute cannot be regarded as a substitute for the official recommendation of the Chief of Engineers and the official approval of the Secretary of War, based upon an application, an investigation, and information adduced at public hearings, as required by the Act of Congress.

We accordingly submit that the City has no authority to construct the dams and divert the waters without the

authority of Congress and the approval of the plans by the Chief of Engineers and the Secretary of War.

IV.

Water Power.

The proposed diversion will cause substantial damage to the plaintiff and its citizens by impairing property rights that are dependent upon the existence of water power appurtenant to their riparian lands.

The Master's conclusion on this point is, that as a matter of law New Jersey was not entitled to injunctive relief in so far as relates to water power; and that as a matter of fact the development of water power would not be financially remunerative (R. 4858; Rep. p. 105).

During the hearings and on the argument before the Special Master, plaintiff specifically pointed out that the introduction of the question of power into this case was not only for the purpose of showing the damage to developed power but also for the purpose of showing—

(a) The possibilities of regulation of Delaware River and the benefits that would flow therefrom and that the development of power would be capable of being carried out on such a profitable basis as to render regulation for other uses feasible;

(b) The primary purpose of giving consideration to power was to show the extent and character of the riparian rights, their utility for power development as indicating that such riparian rights on the Delaware River in New Jersey have at the present time and have had for many years a market value because of their availability for power development. That market value is a thing which has existed certainly during all the time since Orrok's investigations because he set a market value of $30 per h. p. at least, on the undeveloped power rights in

the river. Consideration of the nature and amount of power is necessary in order to determine how much these existing and established riparian rights appurtenant to lands in New Jersey would be diminished or modified by operation of the New York plan. Consideration of power to the extent, character and cost of power development is therefore of the nature of intermediate or technical evidence necessary for the purpose of determining the damage or reduction in existing value of lands in New Jersey resulting from New York's proposed diversion.

The Special Master has confined his consideration of this subject to the question whether plaintiff is entitled to an injunction to restrain the proposed diversion on the ground of the effect upon water power development itself. He ignores entirely the question of the effect of the proposed diversion upon the value of real property of the plaintiff and its citizens which will result from the loss of power rights appurtenant to their riparian lands. This is a very substantial element of damage which the Master omits to mention or include in the items of damage given under his general conclusions (R. 4952; Rep. p. 193).

The mere fact that the use of water rights on a stream have not been developed, does not impair the right or title of the riparian proprietor to the use of the water for such purpose. The right to redress for invasion of such rights is not conditional for the beneficial user of them. It is sufficient if they are present and available for development.

Angell on Watercourses, p. 760, sec. 795;

Gilzinger v. *Saugerties Water Co.*, 21 N. Y. Sup. 121;

Rubber Co. v. *Rothery*, 132 N. Y. 293.

In *Hudson County Water Co.* v. *McCarter* (209 U. S. 349, 356), Mr. Justice Holmes, in the opinion of this Court, held:

"We are of opinion, further, that the constitutional power of the state to insist that its natural advantages shall remain unimpaired by its citizens is not dependent upon any nice estimate of the extent of present use or speculation as to future needs. The legal conception of the necessary is apt to be confined to somewhat rudimentary wants, and there are benefits from a great river that might escape a lawyer's view. But the state is not required to submit even to an aesthetic analysis. Any analysis may be inadequate. It finds itself in possession of what all admit to be a great public good, and what it has it may keep and give no one a reason for its will."

The property right consists not of the waters itself but in the value which the stream gives to the land through which it flows. This is made up of the power which may be obtained from the flow of the stream.

Farnham on Waters and Watercourses, p. 1565, Sec. 462.

In *Emmons v. Utilities Power Co.*, 141 Atl. Rep. 65, the Supreme Court of New Hampshire considered the question of undeveloped water power as an element in damage to a riparian owner resulting from the withholding or diverting of the natural flow of a stream. The defendant challenged the admissibility of evidence on the subject unless it could be proven that the property in question was capable of development only upon the land of the plaintiff. The plaintiff on the contrary contended that proof of such damage was admissible even though the property was not capable of development only in conjunction with other properties.

(p. 67) "An undeveloped water power is a property right inherent in the ownership of the adjacent riparian land, for the value of which, if any, the owner is entitled to compensation when it is taken under the Flowage Act (Pub. Laws 1926, c. 218, Sec. 27 *et seq.*). *Swain* v. *Pemigewasset Power Co.*, 76 N. H. 498, 502, 85 A. 288."

* * * * * * * *

"There is no rule of law that the value of land taken by eminent domain is measured solely by its capacity for valuable uses in and of itself without regard to such external elements, if any, as would probably have affected the judgment of a purchaser at a fairly conducted sale. *Mississippi & R. River Boom Co.* v. *Patterson*, 98 U. S. 407, 408, 25 L. Ed. 206; *Little Rock J. R. Co.* v. *Woodruff*, 49 Ark. 381, 5 S. W. 792, 4 Am. St. Rep. 51, 58."

* * * * * * * * *

(p. 68) "'The fact that the most profitable use could be made only in connection with other land is not conclusive against its (adaptability thereto) being taken into account, if the union of properties necessary is so practicable that the possibility would affect the market price.'"

* * * * * * * * *

"*New York City* v. *Sage*, 239 U. S. 57, 61, 36 S. Ct. 25, 26 (60 L. Ed. 143).

"'The fact that it (the land) was so situated as to be available for a union with other lands to make up a reservoir site may have had effect in adding to the amount obtainable for it by the owner from some one desiring to buy it. It was open to the defendant to prove the market value of his land, by whatever circumstances or influences that value may have been affected.' *Medina Valley Irrigation Co.* v. *Seekatz* (C. C. A.), 237 F. 805, 807.

"The true rule seems to be that the enhanced market value, if any, of the plaintiff's land, due to its adaptability for valuable uses in conjunction with other properties, may be shown if the practicability of the combination of all the necessary properties upon which such availability depends was at the time of the condemnation so great as to have probably affected the public mind, and therefore to have enhanced the price which a purchaser might be expected to give."

* * * * * * * * *

"When the property has a special utility to the taker and to others who could have used it for the purpose for which it is sought, and that utility is

such that it would probably have affected the judgment of one desiring to purchase, such utility may be shown. *United States* v. *Boston, C. C. & N. Y. Canal Co.* (C. C. A.) 271 F. 877, 893; *United States* v. *Chandler-Dunbar Co.*, 229 U. S. 53, 76, 77, 33 S. Ct. 667, 57 L. Ed. 1063; *Simpson* v. *Shepard*, 230 U. S. 352, 451, 33 S. Ct. 729, 57 L. Ed. 1511, 48 L. R. A. (N. S.) 1151, Ann. Cas. 1916A, 18; 10 R. C. L. Em. Dom. 115; *Currie* v. *Waverly*, 52 N. J. Law 381, 395, 20 A. 56, 19 Am. St. Rep. 452; *Mississippi & R. River Boom Co.* v. *Patterson*, 98 U. S. 407, 408, 25 L. Ed. 206. In other words, the landowner is not precluded from proving the market value of his land for its most valuable use merely because it is being taken for that use."

Without further quotation or citation from this lengthy and well considered opinion, in which are gathered the decisions of the Federal and state courts, it appears that potential power development is an important element of damage to which a riparian owner is entitled for the diversion or diminution of the flow of a stream past his land.

In *Crooker* v. *Bragg*, 10 Wendell (N. Y.) 260, the New York courts held that mere non user of the waters in the stream did not affect the riparian owners' rights to the whole of the flow for the use of machinery or any other proper purpose.

"The use to which the water of a watercourse may be, and has been, applied, are various; but the value of an estate is much enhanced by the existence thereon of what is called a 'water privilege.' One of the most important uses of it in any part of the United States, is its application to working of mills for machinery; a use profitable to the owner and vastly beneficial to the public."

Angell on Watercourses, 6th Edition, Sec. 93, p. 100; *Holyoke Water-Power Co.* v. *Lyman*, 82 U. S. 500; *Farnham on Waters and Water Rights*, Sec. 462, pp. 1566, 1567.

Taking up the facts:

The first water power survey made by the United States Government of the Water Power resources of the Delaware River was made more than half a century ago. In 1880 it made a thorough and complete investigation of that subject.

"Reports on the Water Power of the United States, United States Department of Interior, 10th Census of the United States 1880," Vol. XVI, Water Power, Part 1, page 607.

That report devotes a number of pages to the description of the available water power on the Delaware River and each of the tributaries from Maurice River to the source of the main branch, including the tributaries of the Schuylkill and Lehigh Rivers.

Since then the utility and value of water power has been greatly increased by the development and transmission of hydro-electric power.

The development of water power was one of the important purposes mentioned in the letter from the Board of Water Supply to Governor Smith suggesting compact negotiations and also in all of the legislation of each of the three states pertaining to those negotiations, Exhibit 315. Power development is also one of the purposes mentioned in the petition for intervention and in the statement of interest and of desired relief filed on behalf of the intervener. It is one of the purposes involved in the policy of the United States for the comprehensive use of water-course as described in Exhibits 284 and 285. It is one of the purposes of the investigation now being made on the Delaware River pursuant to an Act of Congress of 1927 as testified to by General Pillsbury (R. 3653).

It was the subject of a very comprehensive investigation by Colonel Charles Keller of the United States War

Department and discussed in his report "The Power Situation During the War" which is in evidence as Exhibit (substitute for) 115. No better argument could possibly be found in support of the desirability and necessity of the conservation and development of water power on the Delaware River than is to be found in that report.

Beginning at page 217 there is an extensive discussion of the possibility of the Delaware River itself with suggestions for reservoir sites, markets, quantities of power and flow. It will be observed from paragraph 43 of that report that Colonel Keller recommended Cannonsville (as did the New Jersey engineers) as the site for the largest and most desirable reservoir. It will be noted, too, that the sites of reservoirs here given are those of Mr. Orrok, a witness for the defendant city in this case.

The development of water power on the Delaware River above Port Jervis was recommended to the legislature of New York by the Water Supply Commission of that State in its annual report for 1909. Extracts from that report are in evidence as Exhibit 109.

Comprehensive power studies in the northeastern section of the United States were made by the Northeastern Superpower Committee. The results were published by the Federal Water Power Commission. They made their report in 1922 to Mr. Hoover, then Secretary of Commerce (R. 504).

Professor Barrows was a member of the Engineering Committee of that commission appointed to represent the State of Massachusetts (R. 508). The commission made studies for the development of water power in the northeastern section of the United States and went into questions of the relative economy of water and steam power in the whole district (R. 505). The membership of the main committee and sub-committees are given at pages 511-513 of the record and represents all of the New

England and northeastern states, including official representation and participation by the State of New York, through its Conservation Commissioner, State Engineer and Surveyors and a Deputy Attorney-General; by New Jersey, through two commissioners designated by the Governor; and by Pennsylvania, through the Chairman of its Public Service Commission, Director of its Giant Power Survey Board and a Deputy Attorney-General.

Plate No. 13 contained in that report (Exhibit 292) gives specific information relating to water power development on the Delaware River (R. 514). It will be observed that the sources of power were named in that report in the order of their importance, as follows: Niagara River, St. Lawrence River, Delaware River, etc. (R. 516).

Exhibit 81 (R. 223-224) consists of 29 sheets showing maps of available dam sites for storage development, for regulation and for power development on Delaware River from Horton's surveys. On each map is shown in outline the layout of the dam proposed to be constructed. The accuracy of these surveys has not been questioned. It is to be noted, however, as pointed out by Barrows (R. 4447), and Horton (R. 3996), that the flow line of the Experiment Mills Project is in error and should be at elevation 314 instead of 330. With this flow line there will be no interference with the Buckwood Inn or Shawnee Country Club property. The cross-sections of the dam sites show in all cases the character of the material forming the river bed, together with the location of rock wherever rock was found at the dam site.

Exhibit 82 (R. 226-228) consists of two sheets and shows the profile of Delaware River from the head of tidewater at Trenton upstream to Hancock. Locations where rock exists in the stream channel are indicated; the profile of the Erie R. R. above Port Jervis is shown; together with the locations and flow line of proposed dams. The accuracy of these profiles and surveys is undisputed. In

this connection it will be seen that the surface of Delaware River at Port Jervis is at elevation 424 feet above tide. There is, therefore, a fall of 424 feet in Delaware River in 122 miles from Port Jervis to tidewater at Trenton.

Exhibit 104 (R. 458) shows in compact tabular form the names and capacities of storage reservoirs proposed by New Jersey for the regulation and development of Delaware River. The summary shows that the proposed reservoirs, including those on the tributaries, Mongaup, Neversink and Wallenpaupack Creek, would provide a total volume of storage of 124,220 mill. cu. ft., of which 80,670 mill. cu. ft. would be used for stream regulation, for power production, etc., leaving 43,550 mill. cu. ft. of reserve storage available for flushing the stream and for other purposes. Considering only the reservoirs on the main stream and the East and West Branches, excluding tributaries, the total volume of storage which can be provided for regulation of Delaware River at these sites is 112,600 mill. cu. ft., of which 69,360 mill. cu. ft. would be used for stream regulation alone, leaving as before, over 43 billion cu. ft. reserve storage available for flushing the stream.

Exhibit 105 (R. 482), shows in compact tabular form the minimum regulated flow which could be provided, exclusive of reserve storage, at various points along Delaware River and the available power producible therefrom in accordance with New Jersey's plan of regulation of Delaware River.

Col. 3 of Exhibit 105 shows that under the operation of this plan there would be provided a minimum regulated flow at Sparrowbush, which is practically opposite Port Jervis, of 3,600 c. f. s., with an additional regulated flow from the Neversink of 350 c. f. s., making a total minimum regulated flow at Tri-State Rock of 3,950 c. f. s. The drainage area at Tri-State Rock is 3,415 sq. mi. (Exhibit 56),

so that it is possible to maintain a minimum regulated flow of more than 1 c. s. m. at Tri-State Rock. The storage would be progressively increased proceeding downstream and the regulated flow at all points in the river opposite New Jersey would equal or exceed 1 c. s. m., being practically 6,800 c. f. s. at Trenton, where the drainage area is 6,800 sq. mi.

As shown on Exhibit 105, with the stream regulated in this manner, it is possible to obtain 356,300 h. p. of firm or constant power, and of this, 190,400 h. p. of constant or firm power would be obtained adjacent to New Jersey and Penn. on the main river.

Exhibits 106 and 107 (R. 477, 483) give the technical basis of regulated flow and power.

Exhibit 108 (R. 511) is a table comparable with Exhibit 105, and shows details of regulated flow and power available at individual plants on Delaware River *after diversion by New York City*. The net results shown on this exhibit and Exhibit 105 are that before diversion there would be available adjacent to New Jersey and Pennsylvania on the main river, 190,400 net h. p. of firm power, and after diversion, 139,400 net h. p., a diminution in the firm power available resulting from New York's diversion of 51,000 h. p. in New Jersey and Pennsylvania. Similarly for the whole river there is a decrease of 91,000 h. p. due to New York's diversion.

Figures show that the cost of development would be increased from $132 to $144 per h. p. as a result of New York's diversion.

The net income for the section of the river adjacent to Pennsylvania and New Jersey before diversion would be $8,800,000 or 13% on the investment (p. 485); after diversion, $6,200,000 or 11.8% on the investment, or a decrease in net income of $2,000,000 for the section of the river

adjacent to Pennsylvania and New Jersey. This is an indication of the existing value of the riparian rights on Delaware River as they stand at the present time undeveloped.

Exhibit 109 (R. 578) is pp. 376-426, incl., of the Report of the New York State Water Supply Commission, 1909. This exhibit shows conclusively that as far back as 1909, regulation of upper Delaware River by storage and the development of power therefrom was considered favorably by the State of New York. The plan proposed by New York was less comprehensive than the plan of regulation now offered by New Jersey, which covers the entire river. The stream gaging data and government maps available on which to base estimates of power were much less extensive then than now. Nevertheless it was pointed out (p. 420 of that exhibit) that even as far back as 1909, attractive market possibilities existed for the sale of the power; also (p. 424) that apparently the power available could be greatly increased by developing "portions of the 400 feet of fall in the river between Port Jervis and Trenton," and finally (p. 425). "There is consequently a clear field open for a systematic development on a large scale and in the most comprehensive manner by the two States of New York and Pennsylvania working in unison." This related to the development above Port Jervis only. The questions and uncertainties as to available power and feasibility of constructing dams have now been eliminated.

Exhibits 113 and 114 (R. 663-667) are tables comparable with Barrows' tables (Exhibit 105 and 107) showing power available at different sites and totals before and after diversion.

Substitute Exhibit 115 (R. 676) is the Keller Report on the Power Situation during the War (particularly p. 217). This confirms the feasibility of development along the lines suggested by Duncan & Pressey, whose reports were the basis of the reports of George A. Orrok, a witness in this

case, and points out that development of power on Delaware River becomes feasible through the utilization of regulation by storage; that the banks of the stream are high and the land flooded relatively slight in extent; that no railroads would be interfered with except along the East Branch of the Delaware (where N. Y. C. herself proposed to build the Downsville dam), and concludes (pp. 221-222): "This should not only provide cheap and reliable power throughout the entire territory under normal conditions * * * such a system should greatly assist in the industrial development of the community."

Exhibit 139 is the report of Colonel F. C. Boggs on a preliminary examination of the Delaware River from Trenton to Easton authorized by the River and Harbor Act of Congress approved September 22, 1922. This report is dated November 26, 1923. Its primary purpose was to consider the question of improving navigation of the Delaware River from Trenton to Easton but at page 34 (pgf. 17) Colonel Boggs considered the subject of water power as an improvement that might be carried on in conjunction with improvements for navigation. He refers to and discusses Colonel Keller's report (Exhibit 115) and says (p. 36):

> "The power output of this system, based on normal rating of stations, will provide a minimum of 315,000 horsepower for 12 hours a day. If provided, this power would be connected up with the existing power system either of the New York District, northern New Jersey, or Pennsylvania and would be a valuable addition to the power resources of this locality. It is understood that the project has been thoroughly investigated by electrical engineers and power companies, estimates of cost made (approximately $35,000,000 in 1919), and it would undoubtedly have been undertaken as a commercial enterprise before this date except for the difficulties of obtaining concurrent legislative sanction of the three States involved. * * * In addition to being justified as a hydroelectric development, the resulting regulation of stream flow

would have very important influences, on the Trenton-Easton waterway improvement."

Exhibits 290 and 291 (R. 3985, 4000) gives detailed tables of cost estimates of reservoirs for regulation and of plants for power development. These exhibits give in full detail the dimensions of structures, the quantities of materials, such as excavation, concrete, etc., in cubic yards, the unit prices used, and the estimated cost for each item of construction.

All of New York's estimates have been mere comparisons with the cost of other structures without any detail as to the dimensions or quantities of material involved in either structure. Following that method, Mr. Weston E. Fuller sought to criticize New Jersey's estimates of cost of reservoirs for regulation of Delaware River on the ground that these estimates were low in comparison with other reservoirs built for power. This is not the fact, as is shown by the testimony of Barrows (R. 3999). Here the actual figures as to cost per million gallons of storage for a number of reservoirs used for power are given, including the Sacandaga Reservoir, $40 per m. g.; Somerset Reservoirs in Vermont, $80 per m. g.; Davis' Bridge Reservoir, Vermont, $180 per m. g.; all based on present-day prices. Barrows' estimates showed that the cost of the Cannonsville Reservoir would be $54 per m. g.; East Branch, $74 per m. g.; East Hancock, $175 per m. g.; Wallpack Reservoir, $54 per m. g., a weighted average of these four of $77 per m. g. These last costs are given on Exhibit 291.

Fuller's criticism that the structures and spillways for reservoir dams of Barrows were insufficient, was answered specifically and in detail by Barrows on rebuttal (R. 3984, 3987).

Kinnear's criticism (R. 2603-2608) of the power plan because of the alleged requirement of the relocation of

sixty miles or so of Erie Railroad tracks and Sparrowbush yard which was not included in Barrows' estimate, is answered not only by Barrows (R. 4016) but also by Mr. Falconer, Chief Engineer of the Erie Railroad Company (R. 4215-4224).

Exhibits 292 and 293 (R. 4002-4004) comprises Plates XIII and XVII from the Northeast Superpower Report, with the preparation of which Barrows was identified. The states of New York and Pennsylvania were officially represented in this work, which was done in 1922 under the direction of Hon. Herbert Hoover, then Secretary of Commerce. Pennsylvania was represented by Morris L. Cooke, Director of the Giant Power Survey Board, appointed by Governor Pinchot; New York was represented by Dwight B. La Du, State Engineer and Surveyor.

Plate XIII shows the potential hydro-electric power at sites on Delaware River in blocks of 30,000, 80,000, 40,000, 120,000, 30,000 78,000, 21,500, 50,000, 70,000, 30,000 and 15,000 h. p., respectively, a total of 564,500 h. p. which was considered to be available and capable of commercially feasible development by this committee in 1922.

Exhibit 293 shows the comparative cost of power from various sources and shows (R. 4004) the wholesale cost of firm power per k. w. h. in the New York and Philadelphia regions is ½ to 11 mills. Since the Delaware hydropower could be produced at a materially less cost, this effectively answers all the evidence of witnesses for the defendants that the power could not be marketed at the prices at which it could be produced.

Exhibit 295 (R. 4019) shows that the feasibility of constructing the East Branch Reservoir, as proposed in conjunction with New Jersey's plan of regulation and power development, will be destroyed if New York's diversion is permitted, because the construction of New York's

Downsville Reservoir will take and divert the runoff from 370 sq. mi. out of the total of 468 sq. mi. at the East Branch site. If the East Branch Reservoir is eliminated it will materially reduce the possibilities of regulation for all purposes and diminish the available power output because East Branch is one of the principal storage sites available, having a capacity of 27,900,000,000 cu. ft. or 209,000,000,000 gallons, or as much as all of New York's proposed five reservoirs taken together. This reservoir would contribute a regulated flow of 883 c. f. s. to Delaware River in addition to providing 11,000,000,000 cu. ft. or more than 80,000,000,000 gallons of reserve storage for use in flushing the stream and other purposes.

The object of constructing the reservoirs at other sites, proposed by Weston E. Fuller, would be to replace the storage and regulated flow destroyed by the elimination of East Branch Reservoir. Fuller made no surveys and had no cost estimates. Surveys were made of all of Fuller's suggested dam sites; the cost was estimated and the regulated flow and power which could be produced was determined. These details are given in full on Exhibit 295. Fuller's reservoirs fail to accomplish the result intended. Even with these reservoirs to replace East Branch, the power available adjacent to New Jersey and Pennsylvania would be 20,000 h. p. less than with the East Branch Reservoir and without Fuller's reservoirs (R. 4018). In other words, eliminating East Branch reduces the power available on the river by 60,000 h. p., whereas the construction of Fuller's reservoirs would replace only 30,000 h. p. (R. 4018). Instead of being a benefit, the construction of these reservoirs would be so costly that if built they would reduce the net annual return from power development on the main river from 10% to 7% and would increase the cost of power from 6.5 cents to 8 cents per k. w. h. (R. 4019).

Exhibit 298 (R. 4093) gives detailed cost estimates of Fuller's proposed alternative storage reservoirs.

Exhibit 299 (R. 4094) is a summary of cost estimates of Fuller's proposed alternative reservoirs to replace East Branch, details being given for the individual reservoirs on Exhibit 298. This estimate has not been met or refuted by any evidence in this case. It shows that the reservoirs proposed by Weston E. Fuller to replace the East Branch Reservoir for river regulation would cost over $59,000,000, whereas the East Branch Reservoir will cost $20,000,000. In other words, to use Fuller's alternative reservoir sites to replace East Branch Reservoir would increase the cost of regulation of Delaware River by over $39,000,000. Since this is the cheapest and best available alternative, it may fairly be argued that damage to market value of riparian rights on Delaware River resulting from New York's diversion and the consequent restriction of the opportunities for stream regulation and power development is not less than $39,000,000.

Barrows examined the power dam sites which had been surveyed by Horton (Exhibit 81) and also the storage reservoir sites near the head waters, together with other information developed under the witness' direction (R. 450). The exhibits already described give the detail testimony about available horse-power, kilowatt hours, cost price, probable ownership, etc. It will be sufficient here to give a resume of the results of Barrows' investigation.

It appears that this project would provide a minimum of 356,000 h. p. of 24-hour continuous power with a maximum of 1,117,000 h. p., and an average of 508,000 h. p. of which 309,000 h. p. is strictly primary power; that is, power that would be constantly available. In addition to that, there is secondary power which would be available and salable when excess flows provided additional water. On the main river between New Jersey and Pennsylvania there is available horse-power as follows: 476,000 at the

switchboard; 661,300 at the wheels; an average available of 275,600, of which 190,400 is strictly primary power (R. 482). The details of cost are given in Exhibit 105 and on pages 483-485 of the Record. These cost figures indicate an available net revenue of $8,800,000 or 13% on the total investment which, as Professor Barrows states, is a feasible proposition from the point of view of commercial development. The cost per kilowatt hour which is 6c is so low as to indicate a desirable project. There is also available suitable market for this power (R. 485). In addition, the power development, as shown by Mr. Barnes in his testimony on navigation, and also in the Boggs report (Exhibit 139) and Colonel Keller's report (Exhibit 115) would be splendidly adapted to slack-water navigation, requiring only the provision of locks and a small amount of dredging at the upper end of the pools (R. 486).

The proposed diversion by the defendant city would destroy the possibility of the feasible and practicable development of the water power, because the aggregate amount of water diverted each year would be sufficient to lower the power available to the point where the cost would not be justified by the result. Also it would be impossible to construct the East Branch Reservoir of the power project because of the proposed New York Reservoir at Downsville (R. 489).

The net result of the proposed diversion with respect to this subject is, therefore, that not only is this vast power development destroyed, which is regarded by the Federal Power Commission as the third in importance of all the water power possibilities in the northeast section of the United States, but with it will go the practicability of navigation improvements on the Delaware River because, with the power development, which is self-sustaining, the navigation project could be completed for approximately $12,000,000 and would therefore become economically feas-

ible. Without the power development, while sufficient water would remain for a strictly slack-water navigation project, the cost would amount to approximately $28,000,000 and thus present a serious obstacle in the way of the development of the project. So that the power project represents not only a tremendous natural resource, in and of itself, but it also represents something over $16,000,000 of saving on a navigation project. These two projects have other common and complementary functions. Transportation and power are two primary requisites of industrial development. There are 120 miles of New Jersey river front above Trenton, two-thirds of which would be in the field of the navigation project, which would be available for industrial and commercial development with power at the door. There are over 35 miles of river front in the tidal section, within the territorial limits of the plaintiff, below Trenton, available for commercial development, which would be clearly stimulated by the combined development of navigation and power on the upper river. These are natural resources of paramount importance which plaintiff is reluctant to forego. Of course it will be said that the plaintiff is not entitled to all of this power. The portion thereof lying between New Jersey and Pennsylvania is sufficient to produce an annual net income of over $6,200,000 (R. 492). Presumably half of this might be credited to the plaintiff. However it is not a question of an exact allocation in dollars and cents between the two adjacent states. The most important question is the industrial and commercial possibilities that would result from that power and from the accompanying navigation project, no matter who received the money for the power.

Barrows is professor of water power engineering at the Massachusetts Institute of Technology. He is the author of the principal text book on that subject. He has been working on power projects of this type for

fifteen or twenty years and has made many appraisals of water power rights (R. 495). He appraised the water power rights between New Jersey and Pennsylvania before diversion at $4,200,000 after diversion at $2,900,000. The net result of the proposed diversion is an annual loss in water power rights on the Delaware River below Tri-State Rock of $1,300,000 which is a total economic loss. Allowing $800,000 of this valuation for the development of the power, leaves $500,000 a year as the value of these water rights. Capitalized at 10%, this represents $5,000,000. If the water power rights are divided equally between the two States, New Jersey's share is $2,500,000 which represents the amount which the New Jersey owners of water power rights would lose by reason of the proposed diversion (R. 501).

Mr. Sherman, proceeding on totally independent computations, corroborates and confirms Barrows' figures on water power (R. 664-73). He also confirms Barrows' conclusions as to the effect of the proposed diversion upon the feasibility of this proposed power project (R. 674). He gives his experience on projects combining water power and navigation and describes the advantages of the combined efforts in this instance (R. 678-9). He also points out the great advantage which these reservoirs would afford for water supply, recreation, industrial development, sanitation, keeping back the salinity in the lower river and bay, maintaining an adequate regulated flow in dry periods, and every other use to which the river might be advantageously put (R. 681-3).

Sherman testified that the power project could be built in two years and that capital "could be acquired tomorrow to build the whole works," and that he would expect that the Water Power and Control Commission of New York State would approve such an application, as they did a similar project on the Mongaup, and that the corresponding board in Pennsylvania would do the same, as it

did on the Wallenpaupack (R. 685), and that there would not be difficulty in obtaining the approval of the War Department since the project is directly in line with the recommendations of Colonel Keller (Exhibit 115), the Super Power report of the Federal Power Commission, and the New York Water Supply Report of 1909. It is also in conformity with the Boggs Report, the project considered wherein was approved by the Legislature of the Commonwealth of Pennsylvania. This is the declared policy of the War Department (Exhibits 284 and 285), already quoted and discussed above under this point.

Taking up the question of law:

The admission of this power testimony was objected to by the defendants on the ground that power development on the Delaware River was a purely speculative proposition. They cited in support of this subject the decision of this court in *New York* v. *Illinois, etc.* (274 U. S. 488).

In that case the plaintiff (one of the defendants here) alleged in its complaint that the diversion from Lake Michigan at Chicago may interfere with or prevent the use of water of the Niagara and St. Lawrence Rivers for the development of power. The defendants moved to strike this paragraph from the complaint and the motion was granted because the allegation presented no more than an abstract question which the Court refused to consider. In that case an international boundary water was involved and that allegation introduced into the controversy over the diversion by Chicago of waters from the Great Lakes in which the issues were already framed. A new question not pertinent to the main question and not necessary to its determination. In our case, instead of moving to strike that portion of plaintiff's complaint, both the defendants denied the allegation and the defendant city in addition set up a separate affirmative defense. Having joined issue on this allegation defendant was bound to prove the allegations.

The Delaware power project is not speculative.

It has been the subject of investigation and definite recommendation by the State of New York (Exhibit 109); it has been the subject of investigation by all three states with definite reports and recommendations resulting therefrom (Exhibits 292, 293). It is the subject of investigation begun in June, of 1930, by the War Department and now in progress (R. 3653). It was the subject of a special investigation by Colonel Keller by the War Department (Exhibit 115). It has been the subject of investigation on seven occasions by Mr. Orrok (R. 2285-2286).

Barrows testified that at one site along the Delaware River preliminary work has been done and borings made for a water power development in contemplation of the construction of a dam (R. 444) below Wallenpaupack Bend between the States of Pennsylvania and New Jersey (R. 445).

There is already in existence a high power transmission line running from the Wallenpaupack Plant to or near New York City, which crosses the Delaware at Bushkill with sufficient unused capacity intentionally provided for the purpose of taking power from the Delaware River (R. 445-453).

Horton testified that there are two or three companies in existence willing and ready to undertake this power on the Delaware River or portions thereof and he has assurances from one of them that they are willing to work harmoniously with others interested to provide regulation of the stream for the benefit of all uses (R. 4472).

The question of diverting waters from the Delaware River has been active since 1923 when the City of New York instigated the negotiation of the proposed compacts looking toward the regulation of the Delaware River. It is not strange that all parties contemplating hydro-electric

development on the Delaware River at that time or since have held their plans in abeyance until the final outcome of this litigation, and particularly since the defendant city declared its intention, in 1927, to divert 219 billion gallons of water entirely from the watershed without the consent of the other states. That threat was sufficient to stop any company.

The facts are that the development of power on the Delaware has been publicly investigated and approved by the State of New York in 1909, the U. S. Federal Government in 1919 and by the States of New York, New Jersey and Pennsylvania in connection with the Northeast Superpower Committee Report; that it has been reported upon as entirely feasible and the recommendations made that the necessary rights should be acquired by the Edison Co. of New York—the report being made through their Engineer, George A. Orrok; that in accordance with the evidence in this case the riparian rights for power development have been extensively acquired by the Pennsylvania Light & Power Corp., complete comprehensive development with storage having already been carried out on two of the main tributaries—Wallenpaupack Creek in Pennsylvania and Mongaup River in New York; the Delaware River is not an international boundary water but that power developments can be carried out by private enterprise with no more formality than is required in the case of any other power development where storage is to be built on a stream which is tributary to a navigable river except that in this case the company would be obliged to obtain permission to make the development both in the States of Pennsylvania and New York.

In view of these facts, and the principles of law as above discussed, plaintiff respectfully submits that:

(a) power development on the Delaware River is not a speculative matter, either as to quantity or profitableness,

(b) the potential power adjacent to plaintiff's territory is a natural resource, and one of the natural advantages which plaintiff is entitled to have remain unimpaired. *Hudson County Water Co.* v. *McCarter*, 209 U. S. 349, 356,

(c) whether the master is right or wrong in his conclusion regarding the rights of the plaintiff to have the impairment of this natural advantage or resource restrained, plaintiff is entitled to consideration as damages to the riparian lands of itself and its citizens, the diminution in house power accompanying the diminution in flow that will result from the diversion of any quantity of water by the defendant city, whether that quantity be the 600 m. g. d. proposed by the defendants or the 440 m. g. d. recommended by the Special Master.

V.

Industrial Uses.

The proposed diversion will cause substantial damage to the plaintiff and its citizens by increasing the hardness of the water used and usable for industrial purposes and thereby impair the present and future industrial development of the plaintiff's territory and depreciate the value of the lands of the plaintiff and its citizens.

The Master concluded that the plaintiff had failed to establish that the proposed diversion would make the river water substantially worse for industrial purposes (Rep. p. 138; R. 4894).

He further concluded that by adopting the Plan which he proposed, namely, to decrease the quantity of the diversion, to increase the quantity of the release, and to treat the sewage at Port Jervis, any damage to the plaintiff for this purpose would be "inconsequential" (Rep. p. 138; R. 4894).

So far as the first conclusion is concerned, we respectfully submit that the Report is erroneous in its decision of the question of fact. The evidence on this point may be summarized, as follows:

Exhibits 209 and 210 show the names of the owners and the location of fifty-seven industrial plants along the Delaware River in the State of New Jersey, exclusive of those owned and operated by the United States Government (R. 1532) which are shown in yellow (R. 1534). These exhibits also show the industrial areas on the Pennsylvania side of the river but no industries on the Pennsylvania side are included in those under consideration.

Exhibit 211 shows that those industries use water from the river for condenser purposes amounting to 401,430,000 gallons, and for industrial purposes 95,793,000 gallons. These exhibits also show the waterfront area along Delaware River in New Jersey still available and suitable for industrial and commercial development. As indicated by the absence of figures on the exhibit, the information of the amount of water used by some of these industries was unobtainable. The figures given are therefore only part of the total amount of water so used by these fifty-seven industries (R. 1545).

Exhibits 194, 195, 196 and 197 show the location, names of grantees, dates, frontage, and consideration of all the grants made by the plaintiff of its lands under tidal waters of Delaware River and Bay, for industrial or commercial development and use. All the remaining lands below high-water mark in the tidal section are owned by the plaintiff (R. 1319). Exhibit 193 contains extracts from the laws of New Jersey respecting the grant of state lands under water. Exhibits 192 and 194 show the pierhead lines on Delaware River as established by the United States War Department and the New Jersey Board of Commerce and Navigation (R. 1306-1325).

This information was superimposed on United States Geodetic Survey sheets for convenience and these maps are not used for the purpose of showing municipal or state boundaries (R. 1537).

Exhibit 189 (R. 1276) is a diagram showing the quality of Delaware River water as related to industrial use and hardness, proceeding down the Lehigh River from Freemansburg to Easton and thence to Holland power station. This diagram shows high phenols, sulphates, alkalinity and hardness in the Lehigh, and a marked decrease in all of these impurities in the Delaware below the mouth of the Lehigh because of the influx of fresh water from the Delaware. Hence a diversion which would reduce the fresh water flow in the Delaware from above the Lehigh, with no reduction in the amount of impurities coming in from the Lehigh, will increase the concentration in parts per million of all these objectionable impurities.

The numerical data on which this diagram (Exhibit 189) is based are given on Exhibit 190.

Exhibit 191 (R. 1279) shows graphically the phenol content of Delaware River at Holland Station from daily observation during the period December 15, 1928 to April, 1929. The phenol content runs high during low water periods, as in the fall and winter of 1928 and 1929, when it reached a maximum of 0.01 p. p. m.; or more, on several occasions. During the spring high-water months the phenol content drops to about 10% of its value for the fall low-water period. This shows the necessity of maintaining undiminished the natural flow of fresh water from above the mouth of the Lehigh to keep down the phenol content of Delaware River.

Exhibits 204 and 205 (R. 1506) give tables of basic data and a diagram showing relation between hardness and flow of Delaware River at Riegelsville. These data show that the hardness in parts per million at Riegelsville

increases from about 20 with a flow of 40,000 c. f. s. to 100 with a flow of 2,000 c. f. s. These figures are not met by any comparable data. The conclusion is inevitable that reduction in the flow of Delaware River such as would follow from New York's diversion would result in an objectionable increase in the hardness of the water and cause material damage to plants and communities using this water for industrial and municipal purposes.

Exhibit 206 (R. 1515) shows chlorides in parts per million in Delaware River water at Deep Water, N. J., May to Nov., 1929. The figures show a large increase in the chloride content during the low-water period of midsummer.

Exhibit 207 (R. 1522) is a diagram showing by width of green-shaded portion the natural flow and by red-shaded portion the reduction due to New York's diversion.

The principal testimony on the subject of industrial and commercial development along and use of waters from the Delaware River submitted on behalf of the plaintiff was given by Mr. John Meigs, who was peculiarly qualified on this subject by his experience of twenty years along the Delaware River as a civil engineer engaged in constructing and developing industrial and commercial facilities, not only in the capacity of a consulting engineer in which he now acts, but also as principal assistant engineer of the United States War Department at Baltimore and Philadelphia, director of Department of Docks of the City of Philadelphia, president of the Board of Commissioners of Navigation of the State of Pennsylvania, member of the Board of Advisory Engineers of the Port Facilities Commission of the United States Shipping Board, member of the General Contracts Board of the Emergency Fleet Corporation, member of the present Philadelphia City Planning Commission and member of the Technical Advisory Council of the present Philadelphia Regional Planning Federation (R. 1518-1519).

He carefully inspected both banks of the river between Easton and Trenton, and noted all plants and locations. There is, undoubtedly, substantial opportunity for industry in this portion of the river but he thinks the development will be mainly residential and recreational (R. 1537). For that reason he did not undertake to show on Exhibit 210 the areas available in that section for new industrial development (R. 1538). He visited all the plants along the river below Trenton and inspected their locations. The conferences with the managers by which the information shown on the exhibits was obtained was done by his three assistants (R. 1544) under his direction and supervision (R. 1545). Between Pennsville and Phillipsburg 115½ miles of river frontage are occupied by industries on the New Jersey side. 65½ miles of this are below Trenton on the tidal section. There are still available below Trenton 35 miles of river frontage suitable for industrial development (R. 1556). The requirements for such development are accessibility by land and water, availability of rail and water transportation, markets for raw material and for finished products. The topographical conditions are suitable for plant structures and the conduct of industrial operations. In the case of many industries (R. 1557) an abundant supply of water is essential. Generally any plant which locates on water frontage does so for the specific reason that it needs water, usually for more than one purpose (R. 1557).

Another witness on this subject was Mr. McCollum, a real estate broker of Philadelphia who has specialized in the sale of industrial river front properties since 1905. His business has included transactions on both sides of the river in the States of Pennsylvania, New Jersey and Delaware. He has kept a complete record of sales of Delaware River front property in those three states for the past sixteen years (R. 1579). During that time there have been sold for industrial purposes along the

river 34,441 lineal feet in New Jersey, 67,615 in Pennsylvania, and 29,058 in Delaware (R. 1579), or a total of 131,114 lineal feet (R. 1580). He made a personal inspection of properties along the river in New Jersey by traveling on foot from Florence to Penns Grove, and on the Pennsylvania side from Tullytown to Fort Penn, Delaware, for the purpose of seeing the condition of the land, accessibility of roads, railroads and communities (R. 1580). Five elements enter into the inquiries of prospective purchasers of river front property, namely depth of water, railroads, highways, transportation of labor, labor market and power. Sometimes raw materials and markets are involved (R. 1581). Between Trenton and Penns Grove, about 16½ miles of the New Jersey river front are already industrially developed (R. 1581). There are still available for immediate development 15,000 or 17,000 feet where the land is in condition for use with respect to adaptability, proximity of channel of river, amount of dredging necessary, and the availability of railroad facilities. In addition to that there are about thirty miles of undeveloped river front which is not in condition suitable for immediate use (R. 1581). It is a potential industrial section and can now be used by certain industries such as tank farms for oil industry, of which there are several already located along the river, namely, Vacuum Oil Company with 6,000 or 7,000 acres at Paulsboro which he purchased for them; Standard Oil Company of New Jersey; Paterson Oil Terminal Company at Billingsport (R. 1582); and Shell Union Oil Company. The Sun Oil Company has acquired about 15,000 acres which are not yet developed. There are demands for sites at the present time on both sides. At the time he testified he was negotiating for the sale of 400 acres on Hog Island. The sales since 1916 have included the following purposes and distances in New Jersey, namely, Government Ordnance Depot at Pedricktown (just above Penns Grove) (R. 1582), 10,125 feet; municipal takings,

1,625 feet; shipyards, 6,195 feet; public utilities 1,000 feet; sundry plants 1,800 feet; oil companies 13,696 feet; in total, 34,441 feet. These did not include any resale of old properties, although some portions of these properties have since been resold (R. 1583).

Colburn also testified on this subject. He has specialized in industrial and commercial water front property (R. 1587) for the past sixteen years, principally along the Atlantic tide water, at the Port of New York, Baltimore Harbor and Bridgeport, Connecticut. He cooperated with Meigs and McCollum in the work to which they have testified (R. 1588) and inspected the shores of the Delaware River between Pennsville and Trenton on both sides of the river. Exhibit 209 correctly represents the situation of river front development and available frontage for future development. He has measured the present industrial development on the New Jersey side as representing 16.7 miles (R. 1589) and the frontage available for future industrial development as 35.2 miles where the essential characteristics for good industrial and commercial water front property exist, that is, good relation to source of raw material market, transportation, both rail and water, labor, power and water for industrial uses. All this river frontage is adaptable for industries requiring process water or water for any industrial purpose (R. 1589). With some concerns the availability of a water supply for industrial purposes is of primary importance.

As an indication of the industrial and commercial development of the State of New Jersey, as a whole, during the past four decades, Exhibit 198 shows that the net valuation of its tax ratables have increased during that time from a little over seven hundred million to over six and a half billion dollars. The Counties of Burlington, Camden, Cape May, Cumberland, Gloucester, Hunterdon, Mercer, Salem, Sussex and Warren, which border, and

largely depend for their industrial and commercial development, on Delaware River and Bay, show their proportionate increase (R. 1328-1329).

It was testified by Powell that the hardness of the Delaware River water at Riegelsville increased as the flow of the water decreased (R. 1506) and exhibits were offered (Exhibits 204 and 205) (R. 1507) showing this condition. This was confirmed by Weston (Exhibit 438). The testimony that the hardness increases as the flow decreases remains uncontested. The question is the magnitude of the increase. The only contest on this point was to the effect that Exhibit 204 offered by the plaintiff misrepresented the hardness present at the highest and lowest flows of the river (R. 3888). Powell testified (R. 4114) that he did not believe that the relative accuracy of the two methods was of such sufficient moment to change the ultimate results, and the actual figures obtained from the two figures definitely establish this fact. In Weston's testimony he stated that the increase in hardness as established by his curve was 2.2 parts per million. The increase in hardness as established by Powell was 2.5 parts per million.

Not only will the hardness of the water be increased by the diversion but also other mineral constituents in the water will increase on account of the increased ratios of the flow of the Lehigh River water to the Delaware River water as a result of the diversion by the New York or Pennsylvania plan. The Lehigh River water has a much higher mineral content (Exhibits 189 and 190) including phenols, hydrogen ion concentration, carbon dioxide, chlorine, sulphates (R. 1275, 1278). This contention of the plaintiff's witness is confirmed by Pennsylvania's witness (Weston) (R. 3905) showing that the sulphates in the water increase as the flow of the river decreases.

Not only will the mineral constituents of the water increase but the organic content of the water will also in-

crease as a result of the diversion, this condition materially depreciating the quality of the water for industrial uses (R. 1569-1571). This has not been contested (R. 4127). Powell testified that

> "Anything that decreases the flow will, of course, depreciate the river, since it will take out the diluting water (R. 4130). Anything that reduces the flow in the river will depreciate the water for industrial uses."

The increased cost of softening the water resulting from the increase in hardness after diversion would be approximately $1,674.00 per year when treating one million gallons of water (R. 1508). This is based on the average increased hardness resulting under the New York plan and based on the indicated increase in hardness from the Plaintiff's Exhibit 205. The increased cost of treatment on the same basis and calculated from the estimated increased hardness taking Pennsylvania figures (R. 4123) would be $1,587.00 per year per million gallons of water treated each day during the year. The only contest in reference to the increased cost of softening the water resulting from the diversion under the New York plan is the unit cost of treatment per grain of hardness removed by the softening system for each million gallons of water treated. The plaintiff's calculations were based on the actual cost of operation of the softening plant at the Vacuum Oil Company in Paulsboro, New Jersey where Delaware River water is used (R. 1508, 1509; R. 4123, 4124). The actual cost of softening water, including all operating charges and 50% for the fixed charges, amounts to $41.65 per grain of hardness removed from the water per million gallons of water treated (R. 4123). Weston estimated the cost of operating a plant at Holland (R.3894) at $8.70. He later admitted that this cost was merely an estimate and did not include filters, building investment, and other items (R. 3946). He further testified that the cost of operation of the softening plant presented by

him was based on the total hardness of 50 parts per million in the water (approximately 3 grains per gallons) (R. 4120, 3947). He testified (R. 3946) that he had never designed any plant along the Delaware River.

In rebuttal Powell (R. 4121) testified that a

> "Zeolite softener is never purchased on the average hardness of the water but always on the maximum hardness. The last two plants that were built under his supervision were both purchased on a water having a maximum of 5 grain per gallon hardness. These were on the Delaware River."

It has been testified and has not been contested (R. 1509) that the increased cost of softening would be the same for softening water for industrial uses as for treating water for boiler feed water purposes.

The diversion under the New York or Pennsylvania plan will increase the operating difficulty of condensers due to the increased organic content of the water and to the presence of algae or aquatic plant life (R. 4115). The organic matter in the river will increase (R. 4116) as the dilution water decreases.

This was noted this summer particularly, where organic matter was high at the Holland Station, where the growth of algae was particularly prolific. They have started to chlorinate the condenser water in order to keep the surface of the condenser tubes clean.

This testimony has not been contested. The influence of the diversion of the Delaware River on the growth of algae, as testified by Powell (R. 4131) was that if there is insufficient water to wash out the algae, the only other way in which they would be disposed of would be by natural death, and (R. 4132), that the growth of algae depends upon the stage of the river; that they only grow abundantly at low stages; that (R. 4133) if by any plan the natural low flow is increased, the algae proportionately decreases, depending on the amount of the increase. If the

increase was very slight, there would be no effect of washing out the algae. If, on the other hand, the increase was quite marked, it would wash out the algae rapidly.

Powell testified that phenols present in the water (R. 1282) affect the operation very seriously, so much so that he recommended to the Holland plant that there might (R. 1283) be a possibility of having to take water from other sources and leaving the Delaware River, due to the fact that if these phenolic compounds which will be distilled over into the evaporator, get into the steam cycle, there may be very serious corrosion. This is a very high-pressure station, one of the highest that has been built in the United States. It was designed for 1,400 pounds and will operate at 1,300 to 1,350 pounds pressure. Now, since the effect of corrosion is greatly accelerated as the pressure and temperature increases in a steam boiler, it may be a very serious situation as the result of these phenolic compounds. Certainly if that continues or increases, it will be necessary for that particular station to find another source of water supply for its boiler feed water uses.

The phenols survive that process and get into the boilers. They are volatile and may go through the entire system and get into the steam cycle. It also would be particularly serious in a plant of this type, due to the fact that the water is condensed and recycled, and very little new water is taken up. Now, if the action takes place of breaking up and recombining a relatively small amount of any acid, it may cause very serious damage because it will break up and form again, and each time do damage to the steel of the boiler.

Anything (R. 1284) that reduces the fresh water entering the Delaware or passing in the Delaware at Easton, will depreciate the water for steam-making uses and for industrial uses, due to the fact that the Lehigh River with its higher mineral content will depreciate the value

of the water. Exhibit 189 shows the extent to which this phenol is reduced by the confluence with the Delaware. The phenol concentration would increase in the Delaware if the volume of fresh (R. 1285) water in the Delaware was reduced. The rate of increase would apply proportionately to any decrease in the flow. As the water is taken out the phenol would increase, provided there would not be the same proportion as there was in the exhibit (R. 1285). The taking out of water from the headwaters of the Delaware, under the conditions as they exist today, would have a tendency to increase the concentration of the mineral constitutents in the water below the point where the Lehigh River enters the Delaware River. That applies to all of the chemical elements shown in Exhibit No. 189.

It was testified (R. 1290) in answer to question by the Special Master that phenols practically could not be removed from the water.

"*By the Special Master.*

Q At this Holland Station of which you speak, have you some apparatus for removing these phenols?

A They cannot be taken out very readily. There is only one method I know of, and that is still experimental, in reference to taking them out.

Q What was done at that station toward improving the water to be used?

A We put in the most elaborate system we could find, and if there is any indication that the water becomes depreciated to the point where it causes damage, we will abandon that stream, and have already secured rights on other streams, and if that condition continues to get worse we will have to abandon that stream, by which I mean the Delaware I am speaking now about the Delaware. We would have to abandon that and take another stream not so polluted."

Powell (R. 1292) testified that the corrosion will increase as the result of the production of hydrogen sulphide re

sulting from the decomposition of organic matter and that this product would pass through the evaporator.

Powell (R. 1511) testified that the high chlorides in water (Exhibit 206) were detrimental to the operation of boilers and condensers, and that diversion under the New York plan would increase this difficulty.

High chlorides in the water are detrimental for power uses, either for use in water as boiler feed water make-up, or for condensing water. If the condenser leaks—and it is very difficult to keep condensers absolutely tight—chlorides getting into the water will result in corrosion. The diversion of the river as proposed by New York would tend to increase the chloride content at deepwater station (R. 1571).

The main discussion in reference to the Delaware River water was the quality of water in reference to the chloride and in reference to microscopic growth which might have a detrimental effect on the operation of surface condensers. It is for this reason that the chloride determinations were made, since if the chlorides were high there would be a resulting condition during certain season of the year where a given condenser leakage (R. 1572) might be highly detrimental, since the chlorides in the river at this point would contain also some magnesium chloride as well as sodium chloride, and magnesium chloride is very detrimental in the operation of the boiler, due to the fact that it is a highly corrosive agent and recycles under the influence of high temperatures.

Mr. Orrok, New York's witness, states (R. 2288) that from his knowledge of the operation of power plants, he would rate the water of the Delaware River, as a boiler feed water, as quite good water for boiler purposes in the ordinary plant. For 1,400-pounds pressure use, such as Holland, distilled make-up water is a necessity. If phenols are present in any quantity, the distillation ap-

paratus should be of the type known as double effect. The amount of hardness shown in Exhibit No. 205 is ordinary. Most boiler plants have to deal with waters of greater hardness than 100 p. p. m. On cross examination he admitted that (R. 2325) he never used parts per million; that he is not a water supply man. Mr. Powell, who qualified as an expert in Chemical Engineering specializing on the treatment of water, stated that water containing the hardness of 70 parts per million, may do very great damage in a boiler, especially a high-pressure boiler. This was not contradicted.

The reduction in the flow of the river resulting from the diversion will result in added cost to the operation of any industry where treatment of the water is desired.

The following is a summary of the detrimental effect of the proposed diversion on the quality of waters for boiler feed and industrial uses:

1. The hardness of the water and the mineral and organic content of the water increase as the flow in the river decreases.

2. The increased hardness of the river water resulting from the diversion will increase the cost of softening the water for boiler feed or industrial uses.

3. The proposed diversion under the New York City plan or the Pennsylvania plan will increase the cost of the operation of surface condensers. This is due to the increase of the organic content of the water and to the tendency for more prolific growths of algae which occur at the lower stages of the river.

4. The corrosive properties of the water will increase by the New York or Pennsylvania plan owing to the increase concentration of phenol products which will increase as the flow of the river decreases at points below where the Lehigh River enters the Delaware River. Likewise, the production of hydro-

gen sulphide resulting from the decomposition of organic matter in the bed of the river at low flows will increase the corrosive properties of the water and these conditions will be detrimental to the operation of steam generating stations since both phenol products and hydrogen sulphide will not be removed by any known method of water purification now employed.

5. The reduction of the flow of the river resulting from the New York or Pennsylvania plans will result in marked increase in the salt content of the river water at points below Philadelphia. This condition will depreciate the quality of the water for use in steam boilers, cooling water for surface condensers and other industrial uses.

6. The reduction in flow of the river resulting from the diversion will increase the cost of treatment of the water for any industrial uses. Based on the increased hardness resulting from the diversion under the New York plan, calculating the added costs at $1,587.00 per year per million gallons (R. 4123) there will be an increased annual cost of treatment of the various New Jersey industries using Delaware River water shown on Exhibit 211, as follows:

Condenser water	$637,069.00
Boiler water	132,023.00
or a total cost of	$769,092.00

There will be an actual loss which would greatly exceed this figure since the losses resulting from corrosion and condenser difficulties could not be calculated owing to the lack of tangible data available for calculating such losses.

This is the amount of annual damage that will result from the proposed diversion to existing industries. It amounts to a capitalized investment of at least twelve

million dollars which these industries will have to carry as an overhead in perpetuity. The same additional overhead or expense will confront all future industries along the river. This added expense will exert its influence upon the selection of a location for future industries which depend upon the use of large quantities of water for condenser or boiler purposes.

The industries located and to be located along the river in New Jersey are entitled to the uninterrupted and undiminished flow of water therein for all proper industrial and commercial uses, and the proposed diversion would be an invasion of their property rights as riparian proprietors of land along the river.

Plaintiff, by grants of subaqueous lands and otherwise, has encouraged the development of such industries, and the commerce that results therefrom, as part of the necessary economic growth of its population and wealth, and such industries and commerce are necessary for the prosperity and welfare of the state and its citizens.

For these grants it has received $797,704.45, at rates ranging from one dollar to ten dollars per lineal foot (Exhibits 196 and 197).

In addition, the evidence shows that plaintiff owns something over 35 miles of tidal shore lands adaptable for industrial development, from which it may derive large revenues in sales to riparian owners, if such locations are not rendered undesirable by changes in the quality or usefulness of the water for industrial purposes. State lands under water are held in trust for the school fund, and all the proceeds from the sale thereof go to, and cannot be diverted from, that fund (*General School Law, Revision of 1903, Secs. 168 and 169, N. J. P. L. 1903, pp. 62, 63; 4 Comp. Stat. 4779*). Upon the salability, and price obtainable depends the amount of the funds available for free public schools in the state.

The proposed diversion will diminish and impair the present, and discourage the future, development of such industry and commerce, and deprive the plaintiff and its citizens of the benefits derived and to be derived therefrom in the amount of their taxable ratables and the proceeds of future sales of riparian lands, and lands under water, for such purposes, and will diminish and impair the value and usefulness of such properties as are already developed for such purposes, to the great damage of the plaintiff and its citizens.

So far as concerns the *second* conclusion of the Master, it is sufficient to say that there is no evidence whatever to show what will be the effect of his upon the hardness of the water.

VI.

Equitable Regulation.

If the defendant city is entitled to divert waters from the tributaries in question, it should be required to do so in the manner which will cause the least damage to the plaintiff and its citizens.

Plaintiff's exceptions 35 to 38, inclusive, invoke the maxim *sic utere tuo, ut alienum non laedas,* if the court should sustain the conclusions of the Special Master that defendants are entitled to divert waters from the Delaware to the Hudson watershed. This maxim applies to conflicting rights of every description. *Hitchman Coal & C. Co.* v. *Mitchell,* 245 U. S. 229, 254; *Balt. & Pat. R. R. Co.* v. *Fifth Baptist Ch.,* 108 U. S. 317, 331.

In discussing this point, plaintiff abates not one jot or tittle from its position that it is entitled to protection by injunction against the threatened invasion of property rights. It has faith in its understanding of

the law and the power of the decisions heretofore cited and discussed. If, however, the court finds that defendants have the right to permanently divert the waters of the Delaware from its own watershed to that of the Hudson River for water supply purpose in the defendant city, the court, in the exercise of its equity powers, and by way of mitigation of damages, should require the defendants to adopt that method of exercising their right which will inflict the least damage.

Such a method, presented by the plaintiff, is referred to by the Special Master as follows:

> "This plan of Prof. Barrows came into the case at a late stage and on the hearing of the rebuttal evidence. It seems to me that this plan imposes an unnecessarily heavy burden." (R. 4957; Rep. 197.)
> * * * "I shall not pursue this plan of release further, as Prof. Barrows, with the frankness and candor which he exhibited in his evidence throughout the hearing, stated that he had not had opportunity to go into the details of the plan suggested by him." (R. 4957; Rep. 197.)

It was not the casual eleventh-hour proposition this language implies, and the phrase ascribed to Professor Barrows is not fairly representative of his, or the other witnesses', testimony concerning it. The record references show that the idea came into the case as early as the sixth day of hearings (R. 570).

The Proposition.

The proposition was that if the defendant city had a right to make any diversion from the Delaware watershed it should be required to take advantage of existing natural reservoir sites; one at a place called Cannonsville, on the west branch of the Delaware river, and the other at a place called East Branch, on the east branch of that river; where reservoirs could be constructed with storage

capacity for impounding, without waste, sufficient water to provide—

(a) A gravity supply to defendant city of 600 m. g. d.;

(b) A regulated flow in the river equivalent to 1 c. s. m. in the form of either a constant daily release of that amount, or daily releases in amounts graduated to the inverse ratio of the natural seasonal flows; and

(c) An excess supply of more than 30 billion cubic feet (or 225 billion gallons) for use in low water emergencies for the benefit of sanitation, industry, municipal water supply, recreation, oyster industry and other needs. (R. 4445-4447.)

Actual surveys and detail plans and estimates in the record show that the cost of such a proposition would be less than the cost of the Neversink reservoir, constituting the first stage, and the Downsville reservoir, constituting the second stage, of the defendant city's plan. In other words; by this means the defendant city could obtain a water supply of 600 m. g. d. at less cost than it could obtain the supply of 440 m. g. d. recommended by the Special Master and at the same time the river flow would be constantly regulated by releases *at least 50% greater* than the *maximum* releases recommended by the Special Master. (R. 4955; Rep. 195, 196.)

As the Special Master states, the defendant city opposed this proposition because its Engineer said it would bar its intended future development of the Delaware tributaries for water supply. (R. 4957; Rep. 197.) While this case involves, directly, a proposed diversion of only 600 m. g. d., the record shows that the defendant city has plans for ultimate diversions from the Delaware river watershed up to 2500 million gallons daily (Exhibit 4, p. 8; Exhibit 314). Such is the future development which this proposition for equitable regulation would bar.

The Effect of the Proposition.

The immediate purpose of defendant city is to take 72% of all of the water of the tributaries in question above the proposed dam sites and approximately 16% of the entire average annual flow at Tri-State Rock; that while it proposed to make what it calls a "purely voluntary" release to the extent of .45 cubic feet per second per square mile of watershed (usually referred to as c. s. m.) during July, August, September and October of each year, and at such other times as the inflow of its reservoirs is less than that amount, it appears by uncontroverted testimony that only part of this release amounts to an additional flow in the river during such periods, since the natural flows range from 75 c. f. s. on the very lowest days (R. 4442) to 231 c. f. s. during 201 days in 1914 (R. 3990).

During each year the defendant city proposed to take at least 219 billion gallons of water out of these tributaries which would otherwise naturally flow down the Delaware River and which, by reason of this diversion, will never get back into the Delaware River watershed.

Professor Barrows testified that the New York plan does not provide a compensating flow; that a compensating flow is one which in any considerable measure will make up for the amount diverted (R. 570).

Arthur E. Morgan testified that three-fourths or more of the water indicated as release under N. Y. plan would have gone down the river anyway. N. Y. releases are not contributions to flow, and therefore not any compensation, or improvement of conditions at any time in the lower river. Compensation water means water that has been impounded or stored and let out in order to raise the otherwise natural water (R. 3666).

What difference there may be in the result if the recommendations of the Special Master for reduction in the

amount of diversion and change in the method of releases, is adopted, it is impossible to tell because these features were never discussed during the hearings or ever suggested to any of the parties prior to the filing of his report on February 2, 1931. No facts or computations were submitted, and none appear in the Special Master's report, to show what if any, effect upon damages these modifications of defendant city's plan would produce. However, as a matter of sound hydrology the suggestion for efficient equitable regulation now being considered is equally applicable to either project. The principle of regulation is to use flows in excess of normal for compensation when the flow is less than normal.

The constant taking of water depletes the river and unless the river is more than just returned to normal there is no advantage in the New York plan. It is only when releases go beyond and increase the normal flow that they confer any benefit on the river (R. 3687).

Mr. Ryder and Mr. Weston both testified that a regulated flow of 1 c. s. m. at Trenton would be better than either the New York or the Pennsylvania plan (which the Special Master adopted) and would bring the change of flow into the realm of appreciation (R. 3537).

The Special Master has found that substantial damage would result from the New York plan, including slight damage to navigation, agriculture, municipal water supply, shad fisheries, and industrial uses, and more than slight damage to the recreational uses of the river and the oyster industry. (R. 4952; Rep. 193.) The testimony shows that a plan of equitable regulation, as is now being considered, would provide the necessary conditions for good operation of water supply (R. 3346) and would benefit the oyster industry (R. 1772).

All of the witnesses of the plaintiff, as well as all of those of the intervener, have shown by their testi-

mony and exhibits that the release of .45 c. s. m., as contemplated in defendant city's plan, would provide a totally inconsequential amount of water. That the Master has reached the same conclusion is evidenced by his rejection of that release and his adoption of that proposed by the intervener.

The record shows that a complete conservation of the river for all uses of which it is capable was contemplated by all three states in the legislation that authorized the negotiation of the proposed compacts. The brief shows, under Point III on the subject of navigation, and under Point IV, on the subject of water power, a definite policy of both the War Department and the Federal Water Power Commission to conserve as far as possible the natural resources of the Delaware River for other purposes, as well as for water supply. Such a comprehensive conservation is also included in the intervener's statement of relief desired (R. 4595; par. (c)).

It appears from the testimony that it is feasible and practicable to do this on the Delaware River, even if the court should find that the defendants have the right to take the water as proposed.

Barnes testified that if the flow of low water discharge should be regulated to 1 c. s. m., or 6,800 second feet at Trenton, the tide gage at the head of the tidal section would be clearly increased and the water level increased for all natural elevations below that amount to the extent of about 14 inches at low water, and that this would be a material benefit to low water navigation during the summer months (R. 1047).

Sherman testified that there is a well recognized practice of impounding waters and releasing compensation waters under which higher flows can be used to provide compensation in water during periods of low flow, which is considered quite advantageous. His criticism

of New York plan is that the percentage of water taken from the watershed is greatly unbalanced with the amount of compensation (R. 724) water proposed to be let down.

He testified that the proposed water power reservoirs at Cannonsville and East Branch would serve the double purpose of power development and an equitable regulation of flow (R. 726): A plan whereby releases would never reduce the flow below that which would come in a state of nature, but in all instances, increase it, would be highly desirable; that is, if the release arrangement could be worked out so as to give a benefit in times of low flow instead of sometimes a benefit and sometimes a detriment, it would be highly desirable. (R. 738).

The reservoirs at Cannonsville and East Branch would provide for a regulated flow that would never be less than 1715 c. f. s. That is what he deems the natural regulated flow and is similar to a plan outlined by Barrows (R. 4088). Witness calls it a natural flow plan because it utilizes the natural asset in the Delaware River insofar as reservoir capacity is concerned. It makes use of a full reservoir capacity instead of destroying a natural reservoir which might exist. These are the same reservoirs shown on his Exhibit 113. The flow of 1715 c. f. s. which would be available for each of the 365 days a year is obtained from the sum of the flows of the Cannonsville watershed 800 c. f. s. and the East Branch watershed of 915 c. f. s. (R. 4088). These reservoirs would have some capacity in addition to 1715 c. f. s. to furnish a flow during such periods as the natural flow may be less than 1 c. s. m. at the lower end of the river toward Trenton. This additional water could be used for flushing or to supply a deficient run-off (R. 4089). Under these plans there could be diverted for water supply for the defendant city, 600 m. g. d. or 928 c. f. s. which would leave 787 c. f. s. as a net regulated flow for the river (R. 4089) and would materially exceed

the natural flow at Port Jervis or Trenton. (R. 4092, 4093.)

Sherman computed the cost of the reservoirs at East Branch and Cannonsville. They can be built for $38,800,000, as compared with $45,000,000 shown on N. Y. exhibits as cost of Downsville Reservoir and Neversink Reservoir, (R. 4090) which furnish only 440 m. g. d. (R. 4955; Rep. p. 195.)

This natural regulated flow plan is not only more economical than the New York plan but is less destructive of New Jersey resources in power or any other features affected by the proposed diversion (R. 4090).

His estimate for the Cannonsville reservoir and the East Branch reservoir is given in detail at page 4091 of the record. The result of that regulated flow is shown in column 8 on Exhibit 298 (R. 4092, 4093).

Barrows testified that while the Pennsylvania plan of release (which the Special Master adopted, R. 4597, Rep. p. 197, 198), undertakes to assure a greater minimum flow than the New York plan, at Port Jervis and Trenton, its execution would take away the summer freshets on the reservoir area entirely and in that regard *it is worse than the New York plan.* Either plan fails to compensate to the desirable extent for the large quantity of water taken away (R. 4023, 4024). He shows the possibility of a full development of storage at Cannonsville and East Branch that would produce a constant regulated flow of 2 c. s. m., one-half of which could be used for municipal supply and the other half for maintaining a regulated flow in the river (R. 4024). These two reservoirs can be built for an amount somewhat less than the cost of the Downsville reservoir alone, as proposed in the New York plan and as established by the defendant city, either in Exhibit 4 or Exhibit 296.

Barrows' testimony corroborates circumstantially the testimony of Sherman already referred to. The development of these reservoirs as proposed would also make it unnecessary for the defendant city to develop the Beaver Kill, Willowemoc or Little Delaware reservoirs, constituting the third stage of the proposed New York plan, which the Special Master proposes to enjoin. (R. 4955; Rep. 195.)

Horton testified that neither the New York or Pennsylvania plan provides enough storage to take care of special situations, but if a system of regulation reservoirs as proposed by the plaintiff's witnesses were constructed and carried out, the advantages of either New York or Pennsylvania plans of operation would be very materially increased (R. 4442, 4443). If that system of regulation were carried out it would provide a minimum regulated flow of 6,800 c. f. s., or 1 c. f. s. per square mile, at Trenton.

If the defendant city should be allowed to divert 600 m. g. d., or its equivalent, 928 c. f. s., there would still be a regulated flow to Trenton of about 5,900 c. f. s.; nevertheless the diversion would amount to about 10% of the regulated flow.

The possibilities of regulation of the river exist and are commercially feasible of accomplishment. If diversion is to be permitted on so large a scale as proposed by the defendant city (R. 4444) that diversion should be made in such a way as would minimize the damages as much as possible and fit in with a general plan of regulation of the entire river. The regulation by the construction of the Cannonsville and East Branch reservoirs would provide storage sufficient to permit the proposed diversion of 600 m. g. d. by the defendant city and at the same time leave one-half available for regulated flow down the river. This proposition balances the use for water supply purposes against other uses which the river can serve (R.

4444). Such a regulated plan would materially reduce the damages resulting from the diversion as now proposed. But in order to minimize those damages it is necessary not only to provide a constant regulated flow, but also to provide storage capacity or reserve storage for emergency let-downs (R. 4445).

While such a plan of regulation would minimize damages it would not prevent damages of a very serious nature. No diversion approaching 600 m. g. d. from the Delaware River, can be made by any possible arrangement of the most perfect regulation without resulting in extensive and serious damages (R. 4447). Such a plan of regulation would cost the defendant city less than its own plan and still provide the same amount of water, because instead of building a system of five reservoirs, they would build only two. There is not enough difference in the elevation of the flow lines of the two systems to make any substantial difference except to slightly increase the size of the conduit leading to Rondout Creek (R. 4448, 4449), and the branch conduits leading to the other reservoirs under the defendant city's plan would be eliminated. The amount of damages on the river below the points of diversion, while not eliminated, will be materially reduced.

Wolman described the Pymatuming Reservoir project at Sharon, Pa., as an illustration of this suggestion of an equitable regulation of the flow of a stream. In that instance a regulated flow 20 times as great as the minimum natural low flow had been provided (R. 4232).

An extended discussion, with numerous examples, of regulation plans with compensating provisions is given on pages 34 to 42 of Exhibit 300-Q. The subject is so clearly set forth there that we will not attempt to summarize or repeat it. We will pause only long enough to observe from page 35 that the New York State water storage law there quoted requires something over .8 c. s. m. reserve flow.

Merriman testified that this plan of regulation would cost $41,649,000 more than the New York plan. His figures are merely approximations, as Exhibit 364 will show. They were not based upon any details of quantity, unit prices, or any other essential elements. On the other hand the testimony of Barrows, Sherman and Horton was based upon actual surveys and detailed estimates, including land to be acquired, damage to land, buildings destroyed, consequential damages, riparian rights, quantity and character of excavation, unit prices and quantities of materials and labor. These detailed estimates are in evidence (Exhibit 290, sheets 1 and 4). While they are denominated "Power Development Projects," they show reservoir costs separately from the cost of power development or machinery. (R. 4058.)

Exhibit 291 gives a comparison of cost between Delaware River Reservoirs, including Cannonsville and East Branch, with other similar projects of the kind, on the basis of actual cost of the others, except one reservoir built in 1912 in which case the cost prices are brought up to present day prices. If Merriman's figures were correct they would still show a saving of approximately $35,000,000 out of his alleged saving of $75,000,000 on the Delaware project, as compared with the others which he considered.

It is to be observed, however, that the supposed saving of 75 million dollars should be reduced by 21 million dollars, representing the cost of the reservoirs on the Willowemoc, Beaver Kill and Little Delaware, which was not included in the total cost upon which that alleged saving was based (Exhibit 364, p. 7).

It therefore appears that if the court decides that the defendants have the right to divert water, there is a feasible and practical method, whereby they can obtain the amount proposed, with the reduction, as far as pos-

sible, of the damages to the lower riparian owners and a considerable saving of cost, without any change in the quality or quantity of the water, to the defendant city.

It is respectfully submitted that if the Court shall permit diversion by the defendants from the Delaware tributaries they should be required to do so by that method which will inflict the least damage upon the plaintiff and its citizens.

VII.

The Master's Plan.

The conclusion of the Special Master that substantial damage to the plaintiff and its citizens could be removed by reducing the volume of the diversion proposed by New York and by modifying the plan of release from impounding reservoirs during periods of low flow, was not within the issues raised by the pleadings and is unsupported by any evidence.

The Master proposes in his Report and Recommendations three modifications of the plan as proposed by New York:

1. To limit the diversion to a maximum of 440 million gallons per day.

2. To change the plan of release to conform to the so-called Pennsylvania Plan.

3. To treat the sewage at Port Jervis.

With these changes he concludes:

> "The modification of the New York plan of diversion, as herein recommended, will leave conditions so that New Jersey will not be unreasonably affected and will occasion only such very slight and inconsequential damage and inconvenience as New Jersey must necessarily bear in the use of a stream in which it has only a common interest with other states." (Report par. 51, p. 207, R. 4968).

The difference between the New York Plan and the Master's Plan is so far as relates to the quantity of water to be decreased, is that New York proposed to take 600 m. g. d., whereas the Master recommends a maximum diversion of 440 million gallons per day.

While New Jersey, of course, prefers (if there be any diversion at all) that it be limited to a maximum of 440 m. g. d., the difficulty with the Master's conclusion is that there was no evidence introduced by any of the parties to show that this limitation would result in eliminating the damage to plaintiff.

The Master found that so far as relates to sanitation there was substantial damage to New Jersey, but that this could be eliminated by requiring treatment of the sewage at Port Jervis and by changing the quantity of water and the method of release (Report, p. 125, R. 4880).

So far as relates to the treatment of sewage at Port Jervis, nobody questions this part of the Report—and indeed the City of New York went on record as consenting thereto; hence, there are no exceptions so far as relate to sanitation.

But the Master further found that the execution of the New York Plan "will at times appreciably impair the use of the river for recreational purposes" (Report, p. 146; R. 4902).

He further found that so far as concerns the effect on oysters that "while the New York diversion will not have the very great damaging effect claimed by New Jersey, yet undoubtedly it will have the effect of producing more than slight damage and there will result a greater damaging effect than New Jersey should be called upon to bear under the principle of fair and equitable apportionment of the waters of the Delaware" (Report, p. 176; R. 4934).

The question, therefore, on this phase of the case is whether the Master's modification in the New York Plan will eliminate the damage to New Jersey in these two aspects—even assuming for the purpose of argument there is no other damage.

The only issue before the Master was as to the effect of the diversion of 600 m. g. d.; that is what New York proposed in its Plan and the evidence of all parties was directed to the effect of such volume of diversion.

None of the parties suggested or considered the diversion of 440 m. g. d.; even New York State and City are dissatisfied with that amount and have excepted to the recommendation of the Master in that respect. No computations were made to show the effect of a diversion of 440 m. g. d.

Having found as a fact that there will be substantial damage to New Jersey in at least two important aspects, the Master concludes that such damage may be eliminated by changing the New York Plan; the difficulty with this conclusion is that there is no evidence by any of the parties to show what would be the effect of such diversion upon the matters where substantial damages are found to be caused by the diversion of 600 m. g. d., without considering for the moment any of the other matters wherein New Jersey claims substantial damages will be caused by the New York Plan.

The other important modification in the New York Plan as proposed by the Master relates to the release of the water from the reservoirs during periods of low flow. The difference between the New York Plan and the Pennsylvania Plan (adopted by the Master) is summarized in the Report as follows:

> "* * * under the New York plan there is a release from the impounding reservoirs of .45 c. s. m. (the equivalent of 275 c. f. s.) every day during July, August, September and October; and there is also a

release of .45 c. s. m. on every day during the eight remaining months of the year—dry day meaning every day on which the water yield of the diversion area is less than .45 c. s. m.

Under the Pennsylvania plan of releases, water is released from the impounding reservoirs at any time that the flow in the Delaware River at Port Jervis or at Trenton falls below .50 c. s. m. As there are 3070 square miles of drainage area above Port Jervis, therefore .50 c. s. m. at Port Jervis means a flow of 1535 c. f. s., and as there are 6800 square miles of drainage area above Trenton, a flow of .50 c. s. m. at Trenton means a flow of 3400 c. f. s. In other words, whenever the flow of the river at Port Jervis is less than 1535 c. f. s. or the flow at Trenton is less than 3400 c. f. s., or both, then, under the Pennsylvania plan there is to be released from the impounding reservoirs sufficient water to restore the flow to .50 c. s. m., provided, however, there is not required to be released at any time more than 30% of the average water yield of the diversion area. As the evidence shows the average run off from the diversion area is 2.2 c. s. m., it follows that 30% of this amount is .66 c. s. m., which is the equivalent (for 610 miles of diversion area) of 402.6 c. f. s., and that figure is the maximum release under the Pennsylvania plan'' (Report, pp. 62, 63; R. 4812).

Again he discusses the difference as follows:

''The matter of releasing water from the impounding reservoirs is a very important one, as it is contemplated that these releases will be made at times of low flow and will thereby be helpful to the stream. I have already explained the difference between the New York plan of releases and the Pennsylvania plan of releases and have expressed my preference for the Pennsylvania plan as it is based upon the stage of the Delaware River and not upon the water yield of the diversion area. The Pennsylvania plan fixes .50 c. s. m. at Port Jervis and Trenton as the control figure to determine when releases should be made. Whenever the river falls below .50 c. s. m. at Port Jervis (the equivalent of a flow of 1535 c. f. s.), or below .50 c. s. m. at Trenton (the equivalent of a flow

of 3400 c. f. s.), or below .50 c. s. m. at both points, then, in that event, releases shall be made from the impounding reservoirs so as to restore the flow to .50 c. s. m., provided, however, the amount to be released does not exceed 30% of the water yield of the diversion area, and as the water yield of the diversion area is 2.2 c. s. m., the maximum release (30%) will be .66 c. s. m., and in a diversion area of 440 square miles (the completion of the second stage) a release of .66 c. s. m. multiplied by 440, gives a maximum release of 290.4 c. f. s." (Report, pp. 195, 196; R. 4955).

But here again the difficulty is that the only issue before the Master was as to the effect of the New York plan both with relation to the volume of water to be diverted, and the method of release; and while the release proposed by the Master *might* be more advantageous, (although there is very positive testimony to the contrary) simply because it gives New Jersey more water and during a longer period of time, the question still remains whether this method of release combined with the proposed diversion of 440 m. g. d. would cause substantial damage to New Jersey; and on this question the record is barren of evidence; and, hence, we come to the conclusion that there is no evidence to show that the modification of the New York plan as recommended by the Master will not cause substantial damage to the plaintiff and its citizens.

(5)

CONCLUSION.

We respectfully submit that the plaintiff's exceptions should be sustained.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1930.

ORIGINAL No. [redacted] 9 B H 5

STATE OF NEW JERSEY,

Plaintiff,

against

STATE OF NEW YORK and THE CITY OF NEW YORK,

Defendants,

and

COMMONWEALTH OF PENNSYLVANIA,

Intervenor.

BRIEF OF THE DEFENDANT, STATE OF NEW YORK, IN SUPPORT OF ITS EXCEPTIONS TO THE REPORT OF THE SPECIAL MASTER.

JOHN J. BENNETT, JR.,
Attorney General of the State of New York,
Solicitor for the Defendant, State of New York.

THOMAS PENNEY, JR.,
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BATAVIA TIMES, LAW PRINTERS,
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IN THE

Supreme Court of the United States

STATE OF NEW JERSEY, Plaintiff, *against* STATE OF NEW YORK and THE CITY OF NEW YORK, Defendants, *and* COMMONWEALTH OF PENNSYLVANIA, Intervenor.	OCTOBER TERM, 1930. ORIGINAL No. 16.

BRIEF OF THE DEFENDANT, STATE OF NEW YORK, IN SUPPORT OF ITS EXCEPTIONS TO THE REPORT OF THE SPECIAL MASTER.

HISTORY OF CASE.

This case was brought by the State of New Jersey, under the original jurisdiction of this Court, to enjoin the State of New York and the City of New York from carrying out their plan to develop 610 square miles of a total of 2389 square miles of Delaware River watershed within the State of New York, for the domestic water supply of the City of New York. The bill of complaint was filed on the 13th of May, 1929. Answers were duly filed by both defendants. On January 6, 1930, the Commonwealth of Pennsylvania was granted leave to intervene and duly filed its statement

of interest and relief. On January 20, 1930, a motion by complainant, State of New Jersey, setting the case down for hearing on bill and answer came on for argument but was withdrawn during the argument. On January 27, 1930, this Court appointed the Hon. Charles N. Burch, Special Master, to take evidence, make findings of fact and conclusions of law, and to submit the same to this Court with his recommendations for a decree.

The Special Master duly heard the testimony offered by the parties and on February 2, 1931, filed his report. New Jersey has filed 42 exceptions to that report, the State of New York has filed 17 exceptions, the City of New York has filed 58 exceptions, the intervenor, Commonwealth of Pennsylvania, has filed no exceptions. The case now stands for argument upon all of these exceptions.

References will be made to the Special Master's Report (Rep. Sp. M.), to the Record (R.), to the pleadings, and to the Exhibits (Ex.).

STATEMENT OF FACTS.

"There is a real need for New York City taking immediate steps to increase its water supply." (Rep. Sp. M. page 201, Finding 16; R. 4962). As early as 1921 steps were taken looking toward an additional water supply (R. 2504). Two attempts were made by defendants to secure compacts with plaintiff and intervenor. (Ex. 4, pp. 8-10.) The proposed compact of 1925 (Ex. 303) would have provided for the distribution of practically all of the yield of the entire Delaware watershed. The proposed compact of 1927 would have permitted New York and Pennsylvania to develop approximately one-fourth of the drainage areas within their bound-

aries, and New Jersey to develop approximately one-half of the drainage area within its boundaries. Although these proposed compacts were approved by the delegates of all of the States and by the Legislature of the State of New York, they failed to secure the approval of the Legislatures of New Jersey and Pennsylvania. (R. 2506-2523.) Thereafter the defendant City prepared its plan (Ex. 4) which is based directly upon the provisions, limitations and restrictions of the proposed form of compact of 1927 (R. 2537). This plan was duly approved by the appropriate City Officials (Ex. 12) and by the Water Power and Control Commission of the State of New York (Exs. 13 and 14). This is the only plan which has to date been authorized to be carried out by authority of the State of New York (the Special Master at R. 3649).

THE PLAN OF THE DEFENDANT CITY.

The plan of the defendant City is set out in detail in Exhibits 4, 13, 14, and by witness Suter at R. 2408 and Merriman at R. 2536-2545. It is to construct five reservoirs on certain tributaries of the Delaware River wholly within the State of New York, to impound the flood waters of these streams, to dispose of them by drawing down to the City of New York for its domestic supply not more than 219 billion gallons of water per year, which is at the rate of 600 million gallons per day, and to release water from the reservoirs to flow down the natural stream beds on every day of every July, August, September, and October, and on every other day during the year when the flow, because of natural conditions, is less than 0.45 cubic feet per second per square mile of drainage area above the dams forming the reservoirs. Such release to be 0.45 cubic feet per second per square mile. The drainage area to be thus developed

constitutes 610 square miles. This is only one-quarter of the Delaware watershed within the borders of the State of New York (Ex. 312).

THE PLEADINGS.

The pleadings are summarized by the Special Master on pages 6 through 12 of his report (R. 4752-4760). Briefly plaintiff alleged that the carrying out of the plan of the defendants would have an adverse effect upon water power rights, sanitation, industries, the oyster industry, shad fishing, municipal water supply, agriculture and recreation. The answers denied the allegations of damage and set out various affirmative allegations of justification and propriety.

The Report of the Special Master (Summarized).

The Special Master among other things found:

1. That there is a real need for New York City taking immediate steps to increase its water supply (R. 4962, finding 16).

2. That the proposed diversion would cause slight damage to navigation, agriculture, municipal water supply, shad fisheries and industrial uses and would cause more than slight damage to recreational uses and to the oyster industry (R. 4952).

3. That no relief should be granted on account of alleged water power rights (R. 4964, No. 30).

4. That the proposed taking of 600 m. g. d. is excessive (p. 193) and should be reduced to 440 m. g. d. (R. 4967).

5. Adopts the Pennsylvania plan of release rather than the New York plan (R. 4955; 4971 at (b)).

6. Requires the defendants to construct a sewage disposal plant at Port Jervis (R. 4970 at (a)).

Exceptions of the Defendant State of New York (Summarized).

The defendant State of New York has excepted to the finding by the Master that there would be even slight damage to any interest on the river as not properly proved; to the limitation of the diversion to 440 m. g. d., as unduly restricting the future needs of defendant State and City which were not litigated and would be premature if raised; and to the Special Master's recommendation that the decree be subject to modification rather than final.

Exceptions of the Plaintiff (Summarized).

The plaintiff has excepted to the refusal of the Master to find that the strict common law doctrine of riparian rights applies and entitles it to a decree. It has also excepted to the Master's finding of only slight rather than of substantial damage to all of those interests in which he failed to find substantial damage, and has excepted to the failure of the Master to find that the diversion is not necessary, that the City has failed to comply with the River and Harbor Act, that plaintiff is not entitled to a decree on account of potential water power interests, and for his failure to adopt a plan of release suggested at the end of the hearings by plaintiff.

Exceptions of the Defendant City (Summarized).

Defendant City excepted to the report of the Special Master in that it reduced the proposed diversion from

600 m. g. d. to 440 m. g. d., that it adopted the Pennsylvania plan of release rather than the New York plan of release, in that it recommended the decree be without prejudice rather than final, and thirty-four additional exceptions based upon the Special Master's refusal to find as requested on miscellaneous matters.

Affirmative Proof of the State of New York.

The State of New York introduced no proof upon the question of damages. It relied for this upon the co-defendant City of New York.

The State of New York introduced evidence concerning the application to it and granting by it of approval (Ex. 5 through 14; R. 2401 through 2451) of the plan (Ex. 4) of the defendant City; introducing the proposed compacts (Ex. 308 and 309) certain State legislation (Ex. 310-311, and Ex. 2); and proof of the State policy of water supply allocation; and the reasons for approval of this plan. By this evidence it appears that any municipality in the State of New York desiring to secure an additional water supply must first secure the approval of the State Water Power and Control Commission (R. 2403; and pp. 57, 59 of Ex. 2, being §§ 521, 523 of Chap. 242, L. 1928) and must before commencing work upon any of the structures thereof, secure the approval of detailed plans of the same Commission (§ 948 *id.* at p. 62 of Ex. 2). In acting upon such applications the Commission is required to consider the needs of the State as a whole for water supply (R. 2404). From the viewpoint of the water supply for all municipalities of the State, the plan (Ex. 4) of the defendant City is the most suitable next addition to the water supply resources of the City of New York for the reason that it

would cause less dislocation of local communities than other schemes, other schemes would require construction of reservoirs and diversion of water from streams in more thickly populated areas, and areas in which the growth of population is rapid, and would interrupt and disturb the normal growth of those communities (R. 2429). The plan is better from the point of view of the City of New York because it will make available a large quantity of pure and wholesome water in a relatively short time and relatively cheaper (R. 2429).

New York State has enacted laws requiring the City of New York to permit any municipality or water district in the Counties of Ulster, Greene, Delaware, Schoharie, Sullivan, Orange, Westchester, Putnam or Nassau, to take and receive from the City water supply system water for the domestic water supply of such municipality or district (§§ 40, 41 of Chap. 724, L. 1905 at pp. 34, 35 of Ex. 2; and Chap. 350, L. 1909 at p. 145, Ex. 2).

The Position of the Commonwealth of Pennsylvania.

Pennsylvania has asked that a slightly different plan of release be adopted than that proposed by New York. This plan provides for slightly greater releases during low flows and for determining times when release should be made by the gage readings at certain points on the main stream rather than at each of the reservoirs. This modification was adopted by the Master (R. 4955; 4971 at (b)).

Pennsylvania asked also that a River Master be appointed when operation of the works commence. This was denied by the Master without prejudice (R. 4972).

The third phase of Pennsylvania's position this defendant feels to be most important. That is, Pennsylvania undertook to demonstrate affirmatively by many and very able witnesses that not only could New York take at the rate of 600 m. g. d. with the Pennsylvania plan of release, but that also Pennsylvania might take an additional 750 m. g. d. and New Jersey an additional 400 m. g. d. without inflicting sufficient damage upon any of the interests set forth in the complaint, or to similar interests in Pennsylvania, to justify an injunction. Pennsylvania's proof of each of these items of alleged damage was thoroughly prepared and ably presented by unquestioned experts. It is most significant that the intervenor took this position, when upon its own bank of the river the interests that would be damaged, if similar interests were damaged on the New Jersey bank, are of much greater importance.

POINT I.

The Doctrine of Riparian Rights does not apply.

This defendant believes that the principal questions of law involved here were very recently considered by this Court in deciding the case of *Connecticut vs. Massachusetts* and that the opinion handed down on the 24th of February, 1931, in that case makes further argument thereon unnecessary. That case decided that disputes of this kind are to be settled not according to the strict common law doctrine of Riparian Rights, but on the basis of equality of right; and that drinking and other domestic purposes are the highest uses of water. It is therefore unnecessary to enter upon a discussion of the question of the apportionment of interstate waters as it has been discussed in the

cases of *Kansas v. Colorado*, 206 U. S. 46; *Wyoming v. Colorado*, 259 U. S. 419; *Wisconsin v. Illinois*, 278 U. S. 367.

The State of New York has modified the strict doctrine of riparian rights by the enactment of various statutes providing for municipal water supply (Ex. 2).

Matter of Board of Water Supply, 211 N. Y. 174.
Smith v. City of Rochester, 92 N. Y. 463.

The strict doctrine of riparian rights does not apply in Pennsylvania.

Rundle v. Delaware & Raritan Canal Co., 55 U. S. 79.

Nor does it in New Jersey.

Collingswood v. Water Supply Commission, 84 N. J. Law 104.
Paterson v. E. Jersey Water Co., 74 N. J. Eq. 49.
Olmsted v. Proprietor of Morris Aqueduct, 47 N. J. Law 311.

POINT II.

The Master's Limit on quantity of diversion Unduly Restricts Future Needs.

A. The Question of Taking in Excess of 600 m. g. d. Is Not Before This Court.

The plan of defendant City (Ex. 4) as duly approved by its official body (Ex. 5), and duly authorized by the defendant State (Exs. 13 and 14) is to take 219 billion gallons a year at the rate of 600 m. g. d. (R. 2408, 2538). The Special Master so understands it (R. 3641, 3649).

The complaint recites that the plan is a representation to this effect (complaint pars. 19 and 22), but contains allegations that defendants intend to take more than this amount (Pars. 20, 21, 22, 35).

A similar contention was made by *Connecticut* as to the *Massachusetts* plan in the recent case between those states. But this Court found that the scope of the Massachusetts project was limited by the Acts of its Legislature and the determination of the War Department, and that the allegation was not one of an existing or presently threatened injury and refused to grant an injunction against something merely feared as liable to occur at some indefinite time in the future, citing,

New York v. Illinois, 274 U. S. 488.
New Jersey v. Sargent, 269 U. S. 328.

The defendants have made no threat and have no intention or purpose of diverting water in excess of 219 billion gallons a year at the rate of 600 m. g. d. It is probable that that amount would serve the defendant City and the other communities in the State adjacent to the City water supply system for many years. But the time might come when either the defendant City or some other municipality or group of municipalities might need to divert additional water from the Delaware for their supply. There is no other municipality within reach of these sources whose population and financial ability would be sufficiently great to bring about this contingency for many years. But when and if that time should come, the defendant State is most anxious not to be bound by a decree of this Court at this time from raising the question.

B. The Probable Basis for the Master's Reduction of the Proposed Diversion from 600 m. g. d. to 440 m. g. d. was Present Need Rather Than Damages.

The plan of the defendant City for the diversion of 600 m. g. d. was to be carried out in three stages (Ex. 4). For only the first two of these stages, had costs been computed or details been considered. Throughout the plan it is apparent that the third stage was considered as a matter for the remote future. "The Third Stage Of The Development. As more distant developments may require, the reservoirs on the Little Delaware river, the Beaverkill and the Willowemoc Creek will be constructed together with the necessary connecting tunnels." (Ex. 4 at P. 15.) The cost of constructing the first two stages over a period of twelve years is set out at pages 3, and 17 through 22 of the plan (Ex. 4). At page 2545 of the record, Mr. Merriman, Chief Engineer of the Board of Water Supply of the City of New York said:

> "The estimate cost of the Delaware plan down to Hill View reservoir is $274,000,000, and its cost covers the delivery of 440 million gallons daily of Delaware water, plus 70 million to 100 million gallons daily of Rondout water, together with 100 million gallons daily of water from the higher levels of the Croton. The quantity of Delaware water here stated as 440 million gallons daily includes only 370 million gallons daily from the East Branch reservoir, plus 70 million gallons daily from the Neversink, no estimate of cost having been made for the developments on the Little Delaware, Beaverkill and Willowemoc."

It seems probable therefore that the Special Master was of the opinion that in permitting the city to divert 440 mil-

lion gallons a day that this, together with said adjacent sources not involving diversion, would make available an additional supply of 610 m. g. d. and that this was all that the defendants seriously contemplated at this time by their plan (Rep. Sp. M. 195; R. 4954-5).

This additional 610 m. g. d., of which only 440 m. g. d. would be diverted waters, would take care of the needs of the defendant City until 1955. The maximum safe yield of the present water supply sources of the defendant City is 1100 m. g. d. (Ex. 321). The annual rate of increase of consumption is between 30 and 31 m. g. d. The capacity of the present supply will be reached in 1935 (Ex. 4, P. 17, and Ex. 321) (R. 2545-6). 610 m. g. d. divided by 30 m. g. d. shows that the capacity of the additional supply will be reached in twenty more years or by 1955. This is on the assumption that the population will increase at the same rate as heretofore. Exhibit 321 is a graph showing the average consumption for each year from 1868 through 1929. The increase in population of the City of New York during the period 1920-1930 was 1,361,879 or 24 per cent. Future growth will presumably be accompanied by a proportionate increase in the already large number of transients in hotels in New York City and in daily commuters from New Jersey (R. 2549).

It may be that this Court will decide that estimates of the population of the City of New York and of other communities which its water system must supply, for a period more than twenty-five years hence, are too speculative and do not constitute a showing of necessity for a present taking. The defendant State is most anxious that a determination in this suit to limit the proposed diversion to 440 m. g. d. should not preclude the next or succeeding genera-

tions from raising the question of their right to divert additional water. It is, therefore, recommended that, if the Court is of such an opinion, it enter a decree modeled after the decree in the case of *Connecticut v. Massachusetts*. Such a form is set out in this defendant's exceptions at page [redacted] thereof (R. 5004).

POINT III.

The findings of damage by the Special Master were not supported by competent evidence, nor the weight thereof, nor of the magnitude required by this Court before it will grant an injunction in a suit of this kind.

A. Legal Principles.

The principle that in a case of this kind the complainant State must establish damage of serious magnitude by proof much greater than that imposed on the complainant in an ordinary suit, has been clearly expressed by this Court:

> "Before this court can be moved to exercise its extraordinary power under the Constitution to control the conduct of one State at the suit of another, the threatened invasion of rights must be of serious magnitude and it must be established by clear and convincing evidence." *New York v. New Jersey*, 256 U. S. 296, 309.

> "Before this court ought to intervene the case should be of serious magnitude, clearly and fully proved, and the principle to be applied should be one which the court is prepared deliberately to maintain against all considerations on the other side." *Missouri v. Illinois*, 200 U. S. 496, 521.

> "In such action by one State against another, the burden on the complainant State of sustaining the allegations of its complaint is much greater than that imposed upon a complainant in an ordinary suit between private parties." *North Dakota v. Minnesota*, 263 U. S. 365, 374.

This principle would seem to remove permanently from the consideration of this Court all of those items of damage which the Master has found to be "slight," "inconsequential" or "immaterial."

The principle that relief will be granted against presently threatened damage to existing interests only and not to possible future interests has also been definitely established by this Court. *N. Y. vs. Illinois, supra; New Jersey vs. Sargent, supra; Connecticut vs. Massachusetts, supra.* The first two cases are directly in point upon the facts in regard to the allegation of damage as to power. They and the Connecticut case are also sufficient to dispose completely of the allegation of damage as to: agriculture (III B 2 *infra*) because that allegation was based upon the claim that the few acres involved were *potential* truck farming areas and there was no proof of any intention or tendency to develop them for that purpose; and potential slack water navigation.

B. The Operation of the Plan Would Not Produce Any Adverse Effect Upon Any Interest of Plaintiff or its Citizens.

1. *The diversion would not cause even a slight adverse effect on navigation or navigable capacity.*

By its Seventh Exception this defendant excepted to the implication at the top of page 95 (R. 4848), of the Special

Master's Report and to his summary finding or conclusion 27 on page 203 thereof (R. 4964) insofar as they found that there would be even a slight adverse effect or any obstruction or interference with navigation or navigable capacity.

The Special Master called (R. 3639) as his own witness, General George B. Pillsbury, Assistant Chief of Engineers of the United States Army. From April, 1928, to June, 1930, General Pillsbury had been District Engineer for Philadelphia. That office had been making special surveys and investigations of many of the Delaware tributaries pursuant to the Rivers and Harbors Act of January 21, 1927 (R. 3643); he had received in September, 1929, from the defendant City a letter (Ex. 351) informing the War Department of the New York plan (Ex. 4), this plan had been known and considered in connection with the departmental survey above mentioned; and upon receipt of this letter careful and detailed computations were made to determine the effect of the operation of the plan on the navigation and navigable capacity of the Delaware River (R. 3644). General Pillsbury in the discharge of his official duties thereafter reported to the War Department that in his opinion the Department was not justified in intervening in the present case because of any adverse effect of the diversion on the Delaware River navigation or navigable capacity (R. 3646).

We wish to call attention to the following parts of General Pillsbury's testimony (R. 3645-3651):

> "So far as navigation is concerned, the effect of a diversion on navigation at and below Trenton will be practically nothing when the river level is at the project plane of mean low water. When the discharge with-

out the diversion is such as to give 21 feet in the channel at low tide the depth with the diversion would be 20.85 feet. When the river discharge is (R. 3646) such to give without diversion 22 feet in the channel at low tide, the depth with the diversion would be, in the long run, 21.75 feet.

"These small differences are far below the accuracy obtainable in dredging and surveying the channel and are far beyond the practical utilization of the channel for navigation. . . . I, therefore, reported to the Department that in my opinion the Department was not justified in intervening in the case at the present time on account of the effect of the diversion on navigation. . . .

"The Delaware River above Trenton at the present time carries practically no navigation. To render it navigable, to render it useful for navigation under present conditions, would (R. 3647) require the construction of locks and dams to provide a slack water improvement. The slope is so steep that a useful channel for present navigation cannot be secured by dredging and rock excavation alone. The amount of water required for the operation of those locks and dams is so small that the flow remaining in the river after the diversion would be much more than ample for the purpose. So that the diversion would not, in my opinion, interfere in any manner with any future improvement of the Delaware River above Trenton, which Congress may make. . . . .

"(R. 3649) I will ask you what, in your opinion, would be the effect of taking, not only the 600 million gallons under the New York plan, but also taking 750 million gallons by Pennsylvania, and 400 million gallons by New Jersey. . . . .

"(R. 3651) My answer is that with the plan of release proposed by the State of Pennsylvania, although I have no detailed computations to establish the effect the diversion would have on navigation, it is my decided opinion that it would have no adverse effect on navigation."

General Pillsbury was supported by Colonel C. W. Kutz (R. 2479) and Roy G. Finch (R. 2974), former State Engineer of the State of New York and member of the present Inter-Oceanic Canal Board appointed by President Hoover These witnesses testified that potential development in the Delaware River above Trenton for slack water navigation would be in no way impaired.

The potential development of the upper Delaware River for slack water navigation is another of those potential interests of complainant State which are too remote to secure relief in this Court. Such was the potential development of water power in the recent case of *Connecticut v. Massachusetts,* and the potential development of the St. Lawrence and of the Delaware for power purposes in the cases of *New York v. Illinois (supra)* and *New Jersey v. Sargent (supra)* respectively.

2. *There would not be even slight or immaterial damage to agricultural land.*

This defendant has, by its Eighth Exception excepted to the Special Master's Summary Finding or Conclusion 35 on page 205 of the report (R. 4966) in so far as it found even slight or immaterial damage to agricultural lands, and to his statement to the same effect at the top of page 151 (R. 4907).

The claim of plaintiff was that the lands at the lowest level along the Delaware River depend for their moisture upon the level of the ground water, that this level depends upon the elevation of the water in the river, that a lower flow would cause a lower ground water level which would damage crops and that these low lying lands are potential truck farms (R. 1998).

The complaint, at paragraph 43 (R. 4551), alleged damage to five thousand acres of agriculture land. At the hearings the testimony of plaintiff claimed damage to only three thousand six hundred fifty acres (Ex. 237, R. 2813). These are scattered in twenty-six tracts, many on islands and so inaccessible (Exs. 235, 237). Of these, five hundred acres seem to belong to Pennsylvania rather than to New Jersey (Marsh at R. 2815 and Ex. 343).

The bottom lands are watered principally by rainfall, which is supplemented by the flow of ground water from the valley sides on its way to the river (Berkey R. 2861). This ground water does not come from the river and its level is always above that of the river (R. 2862). Lateral seepage from the river would affect only extremely deep rooted crops such as alfalfa growing in open soils not more than fifty feet from the river (Morgan R. 2877) and the diversion would have no measurable effect upon the moisture of the tracts in question (R. 2861, 2826) nor upon their agricultural value (R. 2877).

Plaintiff's witness, Harman, admitted that not more than half of the tracts are now cultivated (R. 1984). Actually only a small proportion are now farmed (McManus at R. 2841-2851; Bevans 3995). The cost of clearing the wooded land for cultivation is prohibitive (Pennsylvania's Mor-

gan at R. 3703). Two-thirds of the acres which are cultivated are used for unintensified crops or hay. The value of land used for unintensified crops is twenty-five dollars ($25) per acre (Plaintiff's witness Lee, R. 1994). The trend of development is away from what farming there is, and toward summer vacation use (R. 3995, 3996).

In view of this evidence of plaintiff's own witnesses as well as of the witnesses of the other parties on the present use of the lands in question and similar lands in the valley, the evidence of *potential* value is immaterial. Again the principle of *New York v. Illinois (supra), New Jersey v. Sargent,* and *Connecticut v. Massachusetts* applies.

3. *There will be no material damage to the Delaware as a source of municipal water supply.*

In its Ninth Exception this defendant excepts to the Special Master's Summary Finding or Conclusion Number 33 on page 205 (R. 4965) in so far as it finds that there will be even the slightest adverse effect upon the river as a source of municipal water supply.

This question is closely related to the evidence and findings on the sanitary condition of the river, the use of the river for recreation, and for industries. Experts for the parties most carefully described all of the elements, biological, botanical, bacteriological, chemical and physical, that are part of or affect this stream for these purposes.

Dr. Harrison P. Eddy, among others, detailed the condition and effect of the plan and concluded that the critical times are those of very low flow, and that at these times the effect of the plan would be beneficial because there

would then be releases of water from storage which decrease the concentration of pollution (R. 2900).

The essence of the plaintiff's complaint seems to be that the water treatment plants at Trenton and Burlington would be affected by abstractions of water of superior quality above the confluence of the Lehigh River whose waters have taste, odor (phenol), and coal dust, all of which would otherwise be diluted. But by the same reasoning, at the times of low flow when the river would normally be at its worst, it would, if the plan were in operation, be improved. The water treatment plants at these cities are indispensable so long as pollution from the Lehigh or elsewhere continues, and plaintiff failed entirely to establish that their operation would be affected by increase of cost or increase of difficulty as a result of the operation of the plan of the defendant city.

4. *There will not be even slight or immaterial damage to the Shad industry.*

The defendant State, by its Tenth Exception excepted to the Summary Finding or Conclusion 36 on page 205 of the Special Master's report (R. 4966) in so far as it found that there would be even slight or immaterial damage to the shad industry, and to his Finding to the same effect on page 158 of his report (R. 4915).

It had been the contention of the plaintiff that high flows from the river stimulated the migration of shad up stream so that there were greater catches than in periods of low flow. The Master has carefully summarized the evidence on this point and has stated on page 153 (R. 4910) that an "Examination of the statistics which are set out in

Exhibit 349 fails to establish any direct relation between stream flow and the catch of shad." It is undisputed that there has been a decided falling off in this industry in all of the rivers on the Atlantic Seaboard (Ex. 350, p. 487 through 489). The Master's finding that there would be a slight damaging effect upon this industry is based upon his opinion that pollution has a damaging effect upon the shad (R. 4914). But this was not the reason put forth by the plaintiff and does not seem to be supported by any evidence. His uncertainty is indicated by his statement (R. 4914) that there are no doubt other causes for the decline in the number of shad, but that they are of an obscure character which will have to be determined by a more extensive and intensive study by fish experts.

5. *There would not be even a slight adverse effect on industrial uses.*

The defendant State by its eleventh exception excepted to the summary finding or conclusion 34 (Sp. M. R. 205; R. 4965) that there would be even a slight or immaterial adverse effect upon the stream for industrial uses, and to the finding to the same effect on page 138 of the report (R. 4893-4).

The contention of the plaintiff has been that the waters to be diverted would be pure, soft, water, that during its course the waters of the river acquire hardness, and further on acquire salinity; that hardness and salinity are undesirable qualities in waters used for industrial purposes and that the dilution of the pure, soft water is essential.

The plaintiff's endeavor to support this contention rested almost entirely upon the testimony of Mr. Powell (R. 1275,

1564). He discussed the use of water for boiler purposes. It appears, however, that water for high pressure boilers must be distilled anyway (R. 3890), and that water in low pressure boilers must be softened, and the water of the Delaware, after the diversion, would be a suitable water for low pressure boilers according to the standards of the American Railway Engineers and Maintenance of Way Association (R. 3891) and the costs of installing a water softener or the increased expense of operating one already installed would be negligible (R. 3893-41).

It is not disputed that the industrial development on the Pennsylvania side of the river is far greater than that on the New Jersey side. Pennsylvania had its engineers make a study of the effect of the proposed diversion upon industrial uses. They reported and testified in this proceeding that there would be no adverse effect (Weston at R. 3886-3901).

The Special Master, after setting out parts of the testimony of the various experts says at page 137 (R. 4893): "In this conflict of evidence between experts of high standing, I observe this outstanding fact and that is that the critical time for the industrial use of water is during the extremely low flow, and at such times there is an increase of flow under the New York and Pennsylvania plan of release and therefore an increase of fresh water for diluting foreign substances. . . . Undoubtedly there will be times when there will be some impairment of the water for such purposes; also, there will be times, when, by increasing the flow of the river, there will be some improvement in the water for said purposes. . . . Only a slight degree . . . and damage . . . will be inconsequential." He then observes that both New Jersey and Pennsylvania should adopt more rigorous and

extensive requirements for treatment of sewage and industrial waste. No doubt there is room here for the application of the principle laid down in *Missouri v. Illinois,* 200 U. S. 496. There relief was denied Missouri in an action brought to restrain Illinois from discharging pollution into the Mississippi, upon the ground that the plaintiff itself was doing the same thing. If the effect of New York's taking pure water out of the upper river is to aggravate a polluted condition below for which New Jersey is in part responsible, the principle would seem to apply, and New Jersey might well be required to keep its own waters clean rather than to ask this Court to compel New York to contribute pure water to dilute New Jersey's pollution.

6. *There would be no damage to the oyster industry.*

The defendant State's twelfth exception excepts to the Special Master's finding or conclusion 38 (Sp. M. R. 205; R. 4966) that there would be more than slight damage to the oyster industry, and to the similar finding at page 176 of the report (R. 4934).

The plaintiff's allegation is that it has oyster beds in Delaware Bay, that the diversion would increase the salinity of the waters in Delaware Bay, that increased salinity would be a less favorable environment for the oysters, and would create a favorable environment for natural enemies of the oyster.

There was a sharp conflict of evidence both as to whether the plan would result in increased salinity of Delaware Bay, and as to whether the presence of natural enemies of the oyster is controlled by conditions of salinity.

The plaintiff's principal witness, Professor Nelson, testified that oysters live in a salinity range of 2.6 parts per thousand to 32.0 parts per thousand, that the most favorable salinities are from 14 to 29 (R. 1642-3), that fresh water salinity is 0.0 and seawater is 33.0 parts per thousand (R. 1643). There are successful oyster grounds in saltness approaching the saltness of the sea, such as those off Cape Charles, Va., (R. 3017, 3020) and at the end of Long Island (R. 3018, Ex. 213).

Seed oysters are grown successfully in salinities far higher than in Delaware Bay. The salinity of the Bridgeport natural seed beds ranges more than 5 to 10 points higher than over Bennies Bed (R. 3019). Over ninety per cent of Long Island oysters are grown from seeds from the Connecticut seed beds where the average salinity is 26.0 (R. 3027).

It is true that the enemies of the oyster cannot live in such low salinities as the oyster can. Drills die at a salinity of 12.8, starfish at 12.8, mussels at 17 (Rep. Sp. M. 164; R. 4921). But the drill is already present on Bennies seed bed in Delaware Bay under existing salinity conditions according to New Jersey's witness J. R. Nelson (R. 2483-2486), and starfish on the planted beds (R. 2484). Salinities in excess of 12.5 now prevail over the Delaware oyster beds and grounds. (N. J. Exs. 300 E, 300 F, 213.) These existing salinities are high enough to permit the oyster drills to live at all times (R. 3714-5). The drill is not always present in salinities above its 12.5 death point. There are no drills, starfish, or mussels in Peconic Bay where the salinities are high (New Jersey's J. R. Nelson R. 2491).

Witnesses for all parties estimated the change in salinity in the Bay would be from 0.5 to 1.5 parts per thousand

(Thomas, R. 1825-6; Wood R. 3007-3010; Morgan R. 3693-5). But the natural variation of flows is so much greater that this is insignificant (R. 3694-5; 3007-10).

The summer releases under the plan, would be beneficial to the oyster (New Jersey's Prytherch on cross examination. R. 1624-5).

7. *Neither recreational uses nor the reputation of the river therefor would be damaged.*

The defendant State by its thirteenth exception excepted to the Special Master's finding or conclusion 37 (Rep. S. M. 205; R. 4966) that the operation of the plan would cause somewhat more than slight damage particularly as affecting the reputation of the river as a recreational resort; and to his finding at page 146 to the same effect (R. 4902).

It was the claim of New Jersey that the proposed diversion would substantially diminish the flow of the river during the summer months (Comp. Par. 32 R. 4547). And that this would irreparably injure the rights of the plaintiff and its citizens in the use of the valley as a recreational resort for boating, golfing, fishing, scenery, recreation and pleasure. The Master very well points out (R. 4896) that these recreational activities ordinarily are confined to the summer months and generally extend from about the 15th of June to the 15th of September with the main activities during the months of July and August. We have here really two questions; first, whether the flow of the river would be reduced during the recreational period by the operation of the plan, and secondly, if such reduction consists of merely taking the part of those flows

which constitute summer freshets in excess of the normal summer flow, whether this would inflict a damage. On the first point of whether or not there would be a reduction in the average summer flow the exhibits of the defendant City (Ex. 325, 334) are the most accurate evidence. They are hydrographic charts showing the actual flow of the river on each day of each year from 1905 to 1929, inclusive, at Port Jervis, and at Riegelsville and Trenton, respectively. On these charts there is also shown the flow as it would have been had the plan been in operation. The accuracy of these charts was vouched for by the Pennsylvania engineers. Pennsylvania introduced additional graphs to show the effect on the flow of the diversion if releases were made under the Pennsylvania plan (Ex. 413). Summaries and averages of these effects were made by all the parties and are included in the exhibits, but are not accurate in giving a true picture of actual conditions. An examination of those hydrographs would demonstrate the insignificance of any summer takings under either plan and the predominance of releases.

On the second question there is of course no dispute that there are occasional summer freshets, and that under the operation of either plan the surplus of such freshets over normal flows would be impounded. It was plaintiff's contention that these summer freshets are desirable and necessary for recreational purposes, but the argument was based upon the proposition that they are useful from a sanitary point of view, in that they scour out pollution which has accumulated as sludge deposits. There is a flat contradiction between the experts as to the value of these summer rises. Mr. Eddy, Mr. Hazen and Mr. Merriman for New York and Mr. Weston for Pennsylvania, consider they are detrimental from a sanitary standpoint in that they scour

out and bring down these sludge deposits and thereby increase the B. Coli. in the most unfavorable time of the year, (R. 2911, 2965, 2629-2631, 3865); whereas Mr. Whitman and Mr. Wollman for New Jersey consider such flushing desirable (R. 4233-4, 4262). The critical period of the year for recreation as for sanitation is the period of low flows and warm weather. The releases under the New York Plan would increase the flow during this period.

Mr. Merriman for the defendant City testified that he had personally made very extensive studies of the river and had taken a canoe trip down the river and that for boating and swimming he believed that there was a maximum as well as a minimum limit to the desirable flow, and that this range was 0.3 c. s. m. to 0.5 c. s. m. (R. 2709).

For bathing purposes, not only the danger of rapid flow during freshets, but pollution is to be considered. The experts for all sides agreed that freshets swept accumulated pollution from the banks of the river and from sludge deposits and that during and after these freshets the stream was more polluted than at any other time. Plaintiff's witnesses believed that it was desirable to have the sludge deposits washed away. Defendant's experts believed that it was most desirable to leave them to be gradually disposed of through the river's self-purifying ability. So far as bathing in polluted water is concerned, this is undesirable, but Mr. Eddy testified that there seems to be no competent evidence of contraction of disease from bathing in outdoor water (R. 2934-2935).

The proper remedy for pollution is the installation of sewage disposal plants by all three parties. So-called

agreements have been made by the health departments of the parties with this in view (Ex. 425, 426).

The defendant State feels that it can not emphasize too much the fact that here again the intervenor Commonwealth of Pennsylvania whose recreational facilities on the river are at least as great and more fully developed than those of the plaintiff, has not opposed the diversion on this score, but has introduced testimony supporting the defendants'. It made a most thorough sanitary survey of the river and its witnesses, Siebert, Stevenson, Swabb, and Weston, testified thoroughly as to the sanitary condition of the river and the effect of the New York and Pennsylvania plans upon it (R. 3823, 3761, 3400, 3425, 3854, 3877).

The solicitude of the Special Master as to the reputation of the river as a place of recreation is probably based upon the testimony of lay witnesses, residents along the river. The examination of these witnesses disclosed that they did not have a clear idea as to what effect the operation of the plan would have upon the flow of the river, nor exact knowledge of the natural variations in the flow of the river from year to year or from month to month (R. 1271). It would not be surprising that laymen in New Jersey do not know and might not for some time understand correctly that the plan of diversion contemplates releases during low flows as well as taking during high flows. The average person reads the newspapers carelessly, and if he has read of this case at all it is probable that his impression is merely that New York is going to divert water which would otherwise flow down the river. Assuming that the river has a high reputation as a recreation area, and that the operation of the plant will have slight effect upon actual conditions in the river, if people, particularly those in New Jersey erroneously believe that the effect will be

far greater than actual and will be adverse, this error and injury to the reputation of the river will not be the result of any misrepresentation or conduct on the part of the defendants. It is one which can be readily clarified by a correct understanding of the true facts and adequate dissemination of such information.

8. *There would be no adverse effect upon the sanitary condition of the river.*

The defendant State has by its fourteenth exception excepted to the finding or conclusion 32 (Rep. Sp. M. 205; R. 4965) in so far as it finds there would be even slight adverse effect upon the sanitary condition of the river and to the similar finding upon page 125 (R. 4880).

The Special Master has very thoroughly summarized the principal evidence upon this question.

New Jersey's claim in brief is that the taking out by New York of pure water in the head waters would increase the concentration of pollution in the lower river because there would be the same amount of sewage and waste material in the river and less water. But the sanitary surveys of the plaintiff and of the intervenor and the testimony of the witnesses of all parties were uniform to the effect that the river receives at various points down its course increments of pure water, of sewage material, of industrial wastes and through its natural processes of self-purification, is at various times polluted or substantially pure alternating as it descends (Ex. 200). It is a large river with a large capacity for self-purification, and the Master was just in finding (R. 4879) "I think all the witnesses,

however, are fairly well agreed that the critical period so far as sanitation is concerned is during the hot summer months and there is little or no danger from unsanitary conditions during the winters months. * * * during the very low flows undoubtedly the condition of the river would be improved either under the New York or Pennsylvania plan and during the very high flows the condition of the river would be made slightly worse under the abstraction of water under the New York plan." We are thus enabled to understand the nature of the slight adverse effect which the Master conceives would result. It is an effect during times of the year which are not the critical times from a sanitary point of view, during periods of cool temperatures when bacteriological and biological activity is low when recreational use is practically nil.

This defendant again calls the attention of the Court to the suggestion made at the discussion on alleged damage to municipal water supply above. So long as plaintiff pollutes the stream it can not come before this Court seeking for relief of this kind. *(Missouri vs. Illinois, supra.)* And that the proper remedy for this condition is the installation of sewage disposal plants and proper treatment of industrial wastes.

POINT IV.

Totaling diverse damages is an erroneous principle.

This defendant has in its sixth and sixteenth exceptions excepted to summary finding or conclusion 39 (Rep. Sp. M. 206; R. 4966) in which he establishes the principle of totalling all the effects of the New York diversion upon the various interests which claim damage and determined that the

result of such an addition was a substantial damage to the plaintiff for which it was entitled to relief.

It would appear from this that the Master had considerable doubt that the damage under either the oyster industry or recreational interests which he found to be more than slight were yet not sufficient to constitute damage of great magnitude or the *quantum* of damage which this Court has said must be sustained or threatened before it will grant relief (Point III A *supra*). The principle of totalling is novel. Mathematically, additions of articles of a different kind are not possible. Nor do the adding together of a few insignificant fractions make a total of one substantial integer. At 193 (R. 4952) the Master said that this total was "more than New Jersey could be expected to bear *under the principle of fair and equitable apportionment.*" It would seem that he believed that in determining a fair and equitable apportionment it was proper to bear the necessity of the party wishing to divert against the damage or inconvenience of the other party. He considered 440 m. g. d. absolutely necessary. But he probably thought that even the defendant City considered that there was no immediate necessity for the 160 m. g. d. because its plans for the third stage are nebulous. An injunction for lack of necessity is quite different from an injunction on account of substantial damages. This defendant will be content if left free to raise the question of the necessity for the additional 160 m. g. d. when 440 m. g. d. capacity is consumed. A finding based on slight damage is not necessary to such a result. No determination should be made in this suit by which these items of slight and insignificant damage shall be given a permanent appraisal as items of sufficient importance permanently to forbid any additional taking of Delaware River water. This defendant asks that the question be left for the future to decide when and if the necessity arises.

POINT V.

The decree should be final and not subject to modification.

Defendant's Seventeenth Exception excepts to Recommendation 9 (Rep. Sp. M. 212; R. 4972) and similar findings. The Special Master by this recommendation has provided that the decree may be modified as to Recommendation 4, provisions a, b and c, and as to Recommendations 6, 7 and 8.

Recommendation 4a refers to installation and operation of a sewage disposal plant at Port Jervis. Perhaps the provision 4a was inserted as a device for enforcing the decree, modeled after the Chicago diversion case, but in that case the defendant had been recalcitrant and some steps to insure construction of the sewage disposal plants were necessary. Defendants here have not shown this attitude. Enforcement of the decree can be secured in the ordinary way without leaving this decree open for modification to that end.

Recommendation 4b prescribes the Pennsylvania plan of release which provides for greater storage and greater releases than the New York plan. It has been the contention of the defendant city that the New York plan of release was adequate. Surely, then the Pennsylvania plan of release would be sufficient. We have attempted to demonstrate above that the plaintiff failed to establish any damage even under the New York plan of release. Plaintiff has indulged in obstructionist tactics since the first attempted compact in 1925, and has not shown any tendency since to co-operate. Leaving the decree subject to modification would give complainant opportunity to apply at any time for releases of larger quantities of water and might well in-

volve all parties in continuous and perpetual litigation without merit.

Recommendation 4c provides access for all parties to the records of flow kept by defendant City as to the operation of the plant. The defendant City has expressed willingness to keep its records open and available at all reasonable times to the other parties and has no intention of disobeying a decree of this court in that regard. Its disobedience might be punished by contempt proceedings rather than by application for modification of the decree.

Recommendation 6 denies Pennsylvania's application for an allocation of 750 m. g. d without prejudice. New York State by official action of its legislature and its Governor in the proposed contracts of 1925 and 1927 expressed its willingness to the taking by Pennsylvania of 750 m. g. d. providing New York State should secure 600 m. g. d. It has not changed its position. It has doubt that the proper procedure for Pennsylvania to secure this water would be an application to modify the decree in this suit. It has not at present developed its plans, either engineering or fiscal, for the utilization of such water. Probably a considerable time will elapse before it is ready to raise this question.

Recommendation 7 denies Pennsylvania's prayer for the appointment of a river master without prejudice. It would appear that the reasons for urging the appointment of a river master would be the desire to have someone of unquestioned impartiality and a person expert in determining time of transit between the reservoirs and the gauging points fixed under 4b. In answer to this, this defendant urges that this Honorable Court will presume that its sovereign states and its metropolis will act in good faith until there is reasonable grounds for believing otherwise, and secondly, that the engineers of the defendant city, who seem

to enjoy the distinction of being at the head of their profession in this country and even internationally, might have as much expertness in observing and providing for time of transit as would the person who might be appointed River Master.

Recommendation 8 provides that the decree is without prejudice to the Congress or War Department in their supervision of navigation. Whether or not the decree is made without prejudice to the right of the Congress and the War Department to exercise their control over navigation it probably could not be claimed that they would be bound by a decree in this suit, since the United States was not a party thereto. It is true the Master officially advised The War Department of the existence of the suit and inquired whether it wished to intervene, but there was no official vouching and no official participation. This would seem to dispose of the matter without indulging in speculation as to the relative jurisdiction of this Honorable Court and the Congress in this regard.

CONCLUSION.

Wherefore, this defendant respectfully requests this Honorable Court to modify the report of the Special Master in the above respects and to enter either of the decrees suggested in Subdivision D of its exceptions.

Respectfully submitted,

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FILE COPY

MAR 30 1931
CHARLES ELMORE CROPLEY
CLERK

IN THE

Supreme Court of the United States

October Term, 1930.

No. [redacted] Original.

STATE OF NEW JERSEY,

Plaintiff,

against

STATE OF NEW YORK and THE CITY OF NEW YORK,

Defendants,

COMMONWEALTH OF PENNSYLVANIA,

Intervenor.

BRIEF ON BEHALF OF THE DEFENDANT, THE CITY OF NEW YORK, IN SUPPORT OF ITS EXCEPTIONS TO THE REPORT OF THE SPECIAL MASTER.

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IN THE

Supreme Court of the United States

October Term, 1930.

No. 16, Original.

STATE OF NEW JERSEY,
Plaintiff,

against

STATE OF NEW YORK and THE CITY OF NEW YORK,
Defendants,

COMMONWEALTH OF PENNSYLVANIA,
Intervenor.

BRIEF ON BEHALF OF THE DEFENDANT, THE CITY OF NEW YORK, IN SUPPORT OF ITS EXCEPTIONS TO THE REPORT OF THE SPECIAL MASTER.

Nature of the Suit.

The object of this suit is to obtain an injunction in favor of the plaintiff perpetually restraining the defendants and each of them from diverting or abstracting any waters from the Delaware River or from any of its tributaries (Complaint, Part IV, pp. 26-27). After its institution the Commonwealth of Pennsylvania was permitted to intervene pro interesse suo (280 U. S. 528), and in its Statement of Interest and Relief Desired (p. 3) joined with

the defendants in denying the validity of the principles asserted in the Bill of Complaint by the plaintiff.

The Pleadings.

The pleadings of the several parties are satisfactorily outlined at pages 5-12 of the Report of the Special Master, and it is considered that, in that regard, no end would be served by what could not amount to much more than a repetition of the work done by the Special Master.

The Proceedings Before the Special Master.

At page 2 of his report the Special Master gives an adequate outline of the proceedings had before him. It would be idle to include herein any further statement in that regard.

The Facts.

On May 25, 1929, the defendant, The City of New York, obtained the approval, pre-requisite under Article XI, Section 521, of the Conservation Law of the State of New York (Exhibit 3), by the New York Water Power and Control Commission (R. S. M. 203, par. 22) of its plan (Exhibit 4) for the next and extremely necessary increment to its water supply for domestic and municipal purposes (R. S. M. 44 and 201, par. 16; Title 16, U. S. Code, Section 821) from five of the non-navigable and wholly intra-state tributaries of the Delaware River (R. S. M. 203, par. 26).

Under the said plan, the flood and waste waters which come into being because of the melting of the accumulated snow and ice, during the Spring of the year, upon an area of 610 square miles of the southern slopes of the Catskill Mountains in the State of New York will be stored in reservoirs (R. S. M., p. 61), thence to be conducted through a

system of tunnels and aqueducts for the purposes of supplying water to the defendant City and its inhabitants for municipal and domestic purposes (R. S. M., p. 177).

The present available sources of water supply for the defendant City are not sufficient to meet its requirements beyond the year 1935 (R. S. M., p. 44), because of its ever increasing population (Exhibits 306, 321).

The defendant, The City of New York, proposes to construct five reservoirs, at Curry, Downsville, Beaver Kill, Parkston and Delhi, N. Y. (R. S. M., p. 83) each of which places is more than 30 miles from the channel of the Delaware River (see map following p. 22 of Exhibit 4*) where it constitutes the boundary between the State of New York and the Commonwealth of Pennsylvania; in which reservoirs, the flood waters, that come into being within the State of New York upon an area of 610 square miles out of the 2389 square miles of the drainage area of the Delaware River within the State of New York, will be stored and impounded, chiefly during the Spring of the year (the time when the congealed moisture accumulated in the form of ice and snow on the high altitudes of the Catskill Mountains turns into water) and thus be kept from raging into the channel of the Delaware River and thence to the Atlantic Ocean, without being of practical use or benefit at any point along the river, and being, in fact, absolutely lost and wasted (R. S. M., pp. 61, 62).

From these reservoirs, the defendant City proposes to draw a supply of the equivalent of 600 million gallons per day and to provide for a storage of a sufficiently additional quantity of this wild or flood water from a very flashy stream (R. S. M., p. 62) for the purpose of augmenting the

* See also map accompanying argument and brief of defendant City before Special Master.

flow in the Delaware River during the dry months of July, August, September and October of every year and on every additional dry day of every year (R. S. M., pp. 54, 55).

The plan of the defendant City (Exhibit 4) sought to be enjoined is the only plan of development which has any official sanction (R. S. M., p. 68) and is in exact accord with the attempted Compact of 1927 (*infra*, p. 27) for the purpose of furnishing to the City of New York one of the great necessaries of life—pure and wholesome water (R. S. M., p. 39).

The Delaware River for a distance of approximately 75 miles from Hancock, N. Y. to Port Jervis, N. Y., constitutes the boundary between the Commonwealth of Pennsylvania and the State of New York, and from there to Trenton, a distance of 120 miles and beyond, constitutes the boundary between the Commonwealth of Pennsylvania and the State of New Jersey (R. S. M., p. 53).

The Intervenor, Commonwealth of Pennsylvania, does not even purport to assert that what the defendant City proposes to do will have any effect whatever upon any interest whatever, to which it owes protection, and declares its position to be that "The Commonwealth of Pennsylvania has no objection to a present allocation of 600 m. g. d. by this Court to New York City and State. After a full consideration of all the facts, the Intervenor has reached the conclusion that this amount does not exceed their fair and equitable share in the waters of the upper Delaware River, and will not cause any substantial damages to its interests, if taken pursuant to the Pennsylvania plan of impounding and release (R. S. M., p. 183).

Brigadier General George B. Pillsbury, Assistant Chief of Engineers of the United States Army, who previously

had been in charge of the Delaware River as District Engineer, was called as his own witness by the Special Master, to determine the extent to which the navigable capacity (note R. S. M., p. 94) of the Delaware River would be affected by the proposed New York diversion. General Pillsbury's testimony was, that careful and detailed computations were made by the army engineers commencing in September of 1929 to determine the effect of the diversion and release set forth in the New York plan (R. S. M., pp. 91, 92) and that his report thereon to the War Department was, that in his opinion the Department was not justified in intervening in the case on account of the effect of the diversion on navigation (R. S. M., p. 93).

The Plaintiff and the Defendant, State of New York, have adopted modifications of the common law doctrine of riparian rights as to the waters of the Delaware River, and, in the Commonwealth of Pennsylvania, the civil law prevails as to the waters and beds of that river (R. S. M., p. 21).

Each of the sovereign parties to this suit has authorized diversions of the waters of the Delaware River, and, at the present time, under legislative authority of New Jersey, the Delaware and Raritan Canal is diverting Delaware River water out of the watershed and into the Atlantic Ocean (R. S. M., pp. 24, 25, 26, 27).

The defendant, The City of New York, is the largest city in the world, with the exception of "Greater" London, and, according to the Federal Census of 1930, has a resident population of 6,930,446, and, in addition to its transient population of 500,000, has a commuter population from the State of New Jersey of 350,000 daily (Record, p. 2549). The demand for water will be in excess of the supply by 1935

and the need for an additional water supply is real and imperative and should not be delayed (R. S. M., p. 44).

The Delaware River water, intended to be diverted to the City of New York from the tributaries involved in this controversy, will be delivered by gravity (R. S. M., p. 48) and is the best water and the most constantly reliable supply (R. S. M., p. 49) and the best and purest water for the municipal water supply of this defendant (R. S. M., p. 51).

Under the defendant City's plan of development, the Delaware River will never again reach its natural low flow stages, as the plan, as approved by the Water Power and Control Commission of the State of New York, requires a release from the storage reservoirs of water to augment the low flows during the entire dry season and on every dry day of the entire year (R. S. M., pp. 54, 55).

This additional flow will be a benefit during the low flows to sanitation (R. S. M., p. 125). There will be times when there will be some improvement of the water for industrial uses (R. S. M., p. 138), and it will be helpful to the Plaintiff's oyster industry in reducing the salinity of Delaware Bay during the dry season and during the very low flows (R. S. M., p. 175).

The intended New York diversion will have no serious effect so far as municipal water supply is concerned (R. S. M., p. 125), and is not objectionable to the Commonwealth of Pennsylvania, which takes much more water from the Delaware River for municipal water supply than does the State of New Jersey (R. S. M., p. 127).

The plan of the defendant city does not violate the Federal Water Power Act (R. S. M., p. 179), affect interstate commerce, nor have any effect of preferring the ports of New York to the ports of New Jersey (R. S. M., p. 182),

contrary to the provisions of the Constitution of the United States.

Such damages as the plaintiff may sustain because of the intended diversion when the plan of the defendant City is in full operation will, at the utmost, vary from "slight and immaterial", to "somewhat more than slight" (R. S. M., pp. 205-206, pars. 32-38). No damage of a substantial nature will be occasioned to any one of the interests in whose behalf the plaintiff instituted this suit.

A more detailed discussion of the facts is contained in the points which follow.

Report of the Special Master.

The report of the Special Master, consisting of 218 printed pages, discusses every proposition of law urged by the parties and every material fact as to which there was evidence. In the main, the defendant City might well rest its case upon the Master's report. It does, indeed, do so, except as to the matters discussed in the following points where, in its opinion, the Special Master made erroneous deductions of fact from the facts which he actually found and originated views as to the legal principles to be applied, which are not consonant with the precedents he discussed.

For the convenience of the Court, there is here set forth an index to the cases, statutes and authorities cited by the Special Master. The pages to which references are made are to the report of the Special Master as filed.

Cases Cited in the Report of the Special Master.

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Summary of Argument.

I.

THE PLAINTIFF STATE ESTABLISHED NO DAMAGE, OF ANY CONSEQUENCE, TO ITSELF OR TO ANY INTEREST WHICH IT MIGHT BE DEEMED TO REPRESENT.

II.

THE DIVERSION FROM THE NON-NAVIGABLE TRIBUTARIES OF THE DELAWARE RIVER, AFFECTED BY THE PLAN OF THE DEFENDANT CITY, OF THE EQUIVALENT OF 600 MILLION GALLONS OF WATER PER DAY DOES NOT EXCEED THE FAIR SHARE OF THE STATE OF NEW YORK IN THE WATERS OF THAT RIVER, UNDER THE DOCTRINE OF EQUITABLE APPORTIONMENT.

III.

THE IMPOSITION OF THE PENNSYLVANIA PLAN OF RELEASE UPON THE TAKING BY THE DEFENDANT CITY OF ONLY 440 MILLION GALLONS OF WATER PER DAY IS INEQUITABLE AND UNJUST.

IV.

THE SPECIAL MASTER ERRED IN RECOMMENDING THAT THE DECREE TO BE ENTERED HEREIN BE NOT FINAL.

V.

THE DELAWARE RIVER IS NOT A NAVIGABLE STREAM ABOVE PORT JERVIS.

POINT I.

The plaintiff State established no damage of any consequence to itself or to any interest which it might be deemed to represent.

The Plaintiff established nothing which might, under any view of the case, be termed damage to its interests as proprietor of its Capitol grounds at Trenton and its park lands known as Washington's Crossing at Ewing in Mercer County, N. J. (R. S. M., p. 199, par. 3; Complaint, pars. 14, 15, p. 10).

The allegations of the bill of complaint with regard to the Plaintiff's said proprietary ownerships along the Delaware River were so obviously included therein as mere make-weight (*Georgia* v. *Tennessee Copper Co.*, 206 U. S. 230, 237) that they will not be further discussed.

The real controversy on the question of damage in this case, therefore, centers around the Special Masters 39th finding of fact or conclusion of law (Report of Special Master, p. 206; see also exception Sixteenth [p. 7] of the defendant State of New York).

In his report (R. S. M., pp. 205-206), the Special Master said:

> "32. The Delaware River is a large stream and a relatively clean stream [but see Complaint, p. 14, par. 23] in the non-tidal section, with the exception of a polluted condition immediately below Port Jervis, though the effect of this pollution largely disappears before the stream reaches Delaware Water Gap. The effect of taking the equivalent of 600 million gallons daily from the tributaries of the Delaware (that is, 928 cubic feet per second) will not

materially affect the sanitary condition of the river. The effect will be slight and immaterial.

33. The Delaware River is the source of water supply of Trenton, New Jersey, and other New Jersey municipalities. The New York diversion will not materially affect the Delaware as a source of municipal water supply. The effect will be slight and immaterial.

34. The effect of the New York diversion on the waters of the Delaware River for industrial uses will be slight and immaterial.

35. The effect of the New York diversion on agriculture and the cultivation of New Jersey lands bordering on the Delaware River will be slight and immaterial.

36. The effect of the New York diversion on shad fisheries and the shad industry will be slight and immaterial. No definite relation has been established between high flows of the river and large catches of shad. The decline of the shad industry seems to be due more to pollution and to other causes not definitely ascertained.

37. The effect of the New York diversion on the recreational uses of the river will be to cause somewhat more than slight damage, particularly as affecting the reputation of the river as a place of recreational resort. The investment in recreational camps, hotels and other facilities is large.

38. The effect of diversion on the oyster industry in Delaware Bay will be to increase very slightly the salinity of waters over the oyster grounds and to cause somewhat more than slight damage to the oyster industry. The value and extent of this industry are large.

39. *Totaling* all the effects of the New York diversion indicates a substantial damage to New Jersey and its citizens and a greater damage than New Jersey should be required to bear and more than New Jersey should be required to yield to other states in the enjoyment of a common stream."

THERE IS NO SPECIFIC EXCEPTION ON THE PART OF THE PLAINTIFF, STATE TO ANY OF THE ABOVE QUOTED FINDINGS OF FACT OR CONCLUSIONS OF LAW, (280 U. S. 533). Such objections and exceptions thereto, as are filed, come only from the defendants, and it may, therefore, be safely assumed that the Plaintiff does not dissent therefrom (Equity Rule 66).:

> "The governing rule is that this Court will not exert its extraordinary power to control the conduct of one State at the suit of another, unless the threatened invasion of rights is of serious magnitude and established by clear and convincing evidence."
>
> *Connecticut* v. *Massachusetts,* 75 L. Ed. 297, 302;
> *New York* v. *New Jersey,* 256 U. S. 296, 309;
> *Missouri* v. *Illinois,* 200 U. S. 496, 521.

Findings numbered 32-36 inclusive (*supra,* pp. 13-14) of the Special Master are, to a degree, incontestable.

Not even a spoonful of water could be taken from the non-navigable tributaries of the Delaware, involved in this controversy (R. S. M., p. 83), without producing some effect, however slight and immaterial, upon even such distant (R. S. M., p. 53) things as the oysters in Delaware Bay (R. S. M., pp. 205-206, par. 38).

The utmost in damage which the Special Master found was 'somewhat more than slight damage' (R. S. M., pp. 205-206, pars. 37, 38) to the oyster industry in Delaware Bay

(Complaint, pp. 15-17, pars. 25, 26), and to the recreational uses of the river (R. S. M., p. 205, par. 37).

Neither of the said items of damage was

> "SHOWN BY EVIDENCE MAKING IT POSSIBLE OF COMPUTATION OR PROVING THAT IT IS LARGE."
>
> *Connecticut* v. *Massachusetts*, 75 L. Ed. 297, 301.

The Special Master could not compute the somewhat more than slight damage which the Plaintiff's oyster beds in Delaware Bay might sustain because of the full operation of the plan of the defendant City; and the Plaintiff State filed no exception to his 38th (*supra*, p. 14) finding or conclusion, although the claim of the complaint was that:

> "The diversion of water proposed by said City from the headwaters of the Delaware River will SUBSTANTIALLY change the degree of salinity [see R. S. M., p. 205, par. 38] of the water in the Delaware Bay, and ultimately destroy the oyster industry of the plaintiff and its citizens in the Delaware River and Bay. (Complaint, p. 17, par. 26).

It is self-evident that a showing of "somewhat more than slight damage to the oyster industry" (R. S. M., pp. 205-206, par. 38) does not meet the requirement that the damage complained of by a State, in a case of this character, must be proved to be large (*Connecticut* v. *Massachusetts*, 75 L. Ed. 297, 301).

Of peculiar interest in this litigation is the finding or conclusion of the Special Master that the operation of the plan of the defendant City

> "will be to cause somewhat more than slight damage, particularly as affecting the reputation of the river as a place of recreational resort" (R. S. M., p. 205, par. 37).

There was not (R. S. M., p. 146), and there could not be, one word of adverse testimony not wholly opinionative (*Saxman Coal & Coke Co.* v. *Commissioner of Internal Revenue*, 43 F. 2d 556, 557) before the Special Master as to the effect, if any, which the full operation of the defendant City's plan would have upon

> "the reputation of the river as a place of recreational resort" (R. S. M., p. 205, par. 37).

The Intervenor whose 'recreational activities and developments appear to be greater' (R. S. M., p. 140) than those of the Plaintiff

> "HAS NO OBJECTION TO A PRESENT ALLOCATION OF 600 M. G. D. BY THIS COURT TO NEW YORK CITY AND STATE" (R. S. M., p. 183).

Pennsylvania cannot be presumed to be intent on suicide (see *Bean* v. *Morris*, 221 U. S. 485, 487).

Indeed the prime object of that Commonwealth's intervention in this suit was, the protection of the lives and health of its people, by having established, in this cause, its own right to take 750 million gallons daily from the river for the water supply of Eastern Pennsylvania and its city of Philadelphia (Intervenor's Requests for Findings of Fact and Conclusions of Law, p. 2).

The stretches of the Delaware River in New Jersey used for recreational purposes are about 100 miles distant (R. S. M., p. 145) from the diversion areas. How the minds of the recreational public would react to the development planned by the defendant City, and to be located so far away from the scene of their pleasures, cannot be stated with any degree of accuracy, and is incapable of financial admeasurement (see Plaintiff's Brief Before the Special Master, p. 503).

In making his report herein the Special Master did not have the advantage of the opinion of this Court in *Connecticut* v. *Massachusetts*, where it was said:

> "The damage to the hay land is not shown to be of serious magnitude; and, far from being established by clear and convincing evidence, it is not shown by evidence making it possible of computation or proving that it is large" (75 L. Ed. 297, 301).

What the Special Master first found, with regard to the use of the river for recreational purposes, was

> "that the execution of the New York plan will AT TIMES appreciably impair the use of the river for recreational purposes" (R. S. M., p. 146).

Upon later and more searching reflection, he could not bring himself to hold that, of itself, this appreciable impairment amounted to "a substantial damage" (see R. S. M., p. 206, par. 39), nor to anything beyond "somewhat more than slight damage" (R. S. M., p. 205, par. 37), whose principal element was the utterly speculative

> "reputation of the river as a place of recreational resort" (*id.*).

The only evidence, if such it may be called, given before the Special Master on the subject of "reputation of the river" was that of the Plaintiff's witness Hershfield, a real estate agent of Pompton Lakes, N. J. (Record, p. 1901), who said:

> "Q. Is there any other element that enters into real estate matters of that kind *besides the actual conditions?*

A. Well, it is the reputation that a river resort gets, and one case of typhoid has been known to close up a camp, a camp in Pennsylvania, for the whole season. If the river is known to be polluted at a certain point, that ends the people coming there. It spreads, and IF the Delaware River *should unfortunately* get that reputation, in my opinion, the people living along the river would let their property go begging—that is, for the present purpose (Record, p. 1913)."

Mr. Hershfield's testimony was not only founded in great part (Record, pp. 1903-1904) upon confessedly (note Record, p. 1917) hearsay testimony (Record, p. 1906), but was, as the above quotation (*supra*, pp. 18-19) demonstrates so loaded with hypothesis, as to be entirely negligible. Moreover, the testimony of those who could foretell "the actual conditions" (*supra*, p. 18), showed that there could be no basis in fact for the acquisition by the river of an unfavorable reputation. The testimony of the highly skilled scientists **as to the facts**, by which the reputation of the river would, in reason, have to be determined, is quoted extensively, under the heading

"THE EFFECT OF THE OPERATION OF THE PLAN ON THE DELAWARE RIVER WILL NOT BE NOTICEABLE",

at pages 285-289 of the brief (bound in light blue) which the defendant City submitted to the Special Master, copies whereof are filed herewith.

"Injunction issues to prevent existing or presently threatened injuries. One will not be granted against something merely feared as liable to occur at some indefinite time in the future."

Connecticut v. *Massachusetts*, 75 L. Ed. 297, 304.

Not even Mr. Hershfield went so far as to predicate his opinion upon anything more durable than an hypothesis, predicated upon what may have occurred, for reasons having no relation to the condition of the river. There is nothing of positiveness in his testimony, and nothing upon which to predicate a conclusion that at some undisclosed future time, it might be possible for the Plaintiff to allege (see *Connecticut* v. *Massachusetts*, 75 L. Ed. 297, 304) that the reputation of the river was damaged somewhat more than slightly (R. S. M., p. 205, par. 37) by the drafts therefrom made by the defendant City, at points 100 miles away (R. S. M., p. 145).

The "somewhat more than slight injury to the oyster industry" (R. S. M., p. 206, par. 38, *supra*, p. 14), which the Special Master found, was, we think, predicated more upon his kindly feelings toward the few thousand inhabitants of the Plaintiff State engaged in the oyster industry (R. S. M., p. 162) than upon satisfaction (Note R. S. M., pp. 166, 176) with the Plaintiff's testimony in support of its claim that the defendant City's proposed diversion would inflict a disastrous and irreparable injury upon its oyster industry (Complaint, p. 17, par. 26).

In his report the Special Master, discussing the Plaintiff's claims on the subject matter of oysters, said:

> "The outstanding fact in my mind is that the oyster is now living and thriving in Delaware Bay in salinities and conditions of wide variation, that it has adjusted itself to these varying salinities and conditions and that the execution of the New York plan does not make a relatively great change in salinities and other conditions" (R. S. M., p. 176).

The Plaintiff must agree with the above quoted observation of the Special Master. Otherwise, there could be no

state of affairs in which it could find itself able to suggest, as at page 60, paragraph 3, of the proposed findings of fact and conclusions of law which it submitted to the Special Master (Plaintiffs' Exceptions to the Report of the Special Master, p. 15, par. 37).

> "that the proposed water supply for the defendant city of 600 m.g.d. could be provided" * * *,

IF THE DEFENDANT CITY WERE TO IMPOUND AND STORE IN THE SAME WATERSHED IN THE STATE OF NEW YORK, AN EQUAL AMOUNT OF WATER,

> "for increasing and maintaining a regulated flow in the river down stream * * *" (Plaintiff's Exceptions to the Report of the Special Master, p. 14, par. 35).

The oyster comes out of hibernation in April and the spawning season occurs in July and August (R. S. M., p. 163), being two of the four successive months ending with October (R. S. M., p. 10), during which, under the plan of the defendant City, there will be a helpful release of fresh water (R. S. M., p. 175), which will unfailingly (R. S. M., p. 62) increase (see *e. g.*, New York Exhibit 325), the low flows of the river, except upon the unique day of torrential rainfall (see R. S. M., p. 145), which the Special Master probably had in mind when he said (R. S. M., p. 145):

> "Illustrating further, if the river again reaches its record low stage at Port Jervis of 175 c.f.s., during said four months, and at that time there is little or no rainfall in the drainage area above Port Jervis except in the diversion area, and in the diversion area there is a rainfall which produces a water yield in that area of .90 c.s.m., a release under the New

> York plan of .45 c.s.m. (275 c.f.s.) would be helpful, but nothing like so helpful as the natural flow of .90 c.s.m. (550 c.f.s.), which would occur but for the impounding by New York of the flow above .45 c.s.m."

It is not possible to consider that there could be any condition, such as the Special Master suggests in the just quoted portion of his report (*supra*, p. 21), except during the accomplishment of a miracle. Moreover, the Special Master was most gravely mistaken in assuming that the low season flows from the high (R. S. M., p. 145) diversion areas are always greater than the flows from the downstream drainage areas of the river. The fact is, as all the stream flow records demonstrate (see *e. g.*, Exhibits 325, 334) that during the critical dry periods (R. S. M., pp. 124-125) the upper areas in the mountain region (R. M. S., p. 53) yield LESS than do the lower areas. That the average water yield of the upstream mountain sources is high during the winter and spring seasons is due to the accumulating and melting of the snows. In the Summer and Autumn there are no snows to melt—consequently, the contributions of the mountain regions to the river fall off from their Winter and Spring vastness almost, at times, to the vanishing point.

What the situation portrayed by the Special Master in his above quoted (*supra*, p. 21) illustration, more than substantially, requires, is, that during the torrential rainstorm he supposes the stage of the river at Port Jervis be at its lowest and that not one drop of rain should fall on any other part of the total drainage area of 3415 square miles above Tri-State Rock (R. S. M., p. 57) than the catchment area of the 610 square miles proposed to be developed by the defendant City (*id.*).

There is, and can be, in the natural order, no such concatenation of events. But, even if there could, the operation of the plan of the defendant City would increase the flow of the river at Port Jervis from 175 c.f.s. (R. S. M., p. 145) to, in the neighborhood of 450 cubic feet per second (*id.*).

The very lateness of the birth (R. S. M., p. 197) of the above mentioned (*supra,* p. 21) New Jersey plan for the impounding and release of waters by the defendant City, indicates that the allegation of the complaint, viz.:

> "The oyster industry in the Delaware Bay could not exist except for the supply of fresh water which comes down the Delaware River, the *flood waters* of which are essential to drive out of the bay the high salinity and the oyster enemies which invade the oyster beds *only during low fresh water periods*" (Complaint, p. 16, par. 26; R. S. M., p. 160).

was abandoned by the Plaintiff in favor of a new-born scheme, which, at prohibitive expense to the defendant City (see R. S. M., p. 197), would overcome any slight changes of conditions (R. S. M., p. 166) and salinities in the Plaintiff's oyster planting grounds in Delaware Bay that might be caused by the execution of the plan of the defendant City (R. S. M., p. 176).

What the Plaintiff has consistently preferred, in this case, is the cultivation of its relatively unimportant oysters, rather than the life and health of the permanent, transient and commuter population of the great defendant City, by which it has been so greatly enriched (Complaint, p. 22, par. 42). Indeed, the Plaintiff, in favor of its oysters, turns also upon the city of Philadelphia (*id.*), to which, too, it is more than deeply indebted.

As we have demonstrated above, the "more than slight injury" to the Plaintiff's recreational activities, facilities and possibilities, and its oyster industry and activities is for all practical purposes non-existent. The "slight and immaterial" damage to the other interests enumerated in paragraphs 32-36 (R. S. M., p. 205) of the Special Master's report is, likewise, more speculative than real.

The error into which the Special Master fell, when making his 39th finding of fact (*supra*, p. 15), was that of adding several almost nothings and making out of them a much.

There is no authority of law, pure science, or political economy for any such process.

An uncomputable added to one or more uncomputables cannot produce anything but another uncomputable.

In its essence the case for the defendant City in this suit is no less meritorious than that of the defendant in *Connecticut* v. *Massachusetts*, 75 L. Ed. 297, and more worthy, we think, than that of the prevailing defendant in *Kansas* v. *Colorado*, 206 U. S. 46.

If the judgment of the Court be based, alone, upon the actual facts, found by the Special Master, and not upon his factual deductions therefrom, it must follow that any damages which the Plaintiff or its citizens may actually sustain by reason of the operation of the plan of the defendant City are so inconsequential as not to merit the consideration of this Court.

POINT II.

The diversion from the non-navigable tributaries of the Delaware River, affected by the plan of the defendant City, of the equivalent of 600 million gallons of water per day does not exceed the fair share of the State of New York in the waters of that river, under the doctrine of equitable apportionment.

In controversies such as the one at bar it is the high function of this Court to determine what is an equitable apportionment of the use of the waters as to which a dispute exists between sovereign States (*Connecticut v. Massachusetts,* 75 L. Ed. 297, 303).

In the ascertainment of the relative rights (*id.*) of the contending States, this Court could hardly be said to have discharged its high duty in the premises if it were to ignore the fact that,

> "The question of diverting waters from the Delaware River has been active since 1923, when the City of New York instigated the negotiation of the proposed compacts looking to the regulation of the Delaware River" (Plaintiffs' Brief Before the Special Master, pp. 350-351),

and the further fact

> "that New York has not formulated an arbitrary plan of diversion, entirely of its own making, but on the contrary has adopted a plan unanimously agreed to and approved by the commissioners of the three states, though ratified by the Legislature of New York only" (R. S. M., p. 39).

The Plaintiff, the aggressor in this suit, is Sovereign over only 10 miles of the drainage area of the Delaware

River, above Tri-State Rock. The defendant, State of New York, at the said point furnishes 2,389 square miles of the river's drainage area and the Intervenor contributes 1,016 square miles thereto (R. S. M., p. 57). Above Trenton, where the river is non-tidal (R. S. M., p. 92), its total drainage area in the Plaintiff State is only 1,035 square miles (Exhibit 341), out of a total drainage area of 6,894 square miles.

In 1925 (see N. Y. Laws of 1925, Cap. 177) a form of compact (Exhibit 303) between the sovereign parties hereto was agreed upon by their duly appointed Commissioners (acting, not as mere political designees, but as high representatives, peculiarly capable of correctly solving the legal and engineering questions to be determined),

> "relative to conserving the water resources of the Delaware River and making allotments therefrom * * * (N. Y. Laws of 1925, p. 228).

Under this form of compact the defendant State of New York was authorized, subject to the release provisions, to divert from its own tributaries for the purposes therein authorized, which included domestic and municipal purposes, the water of not more than

> "three-fifths of the drainage area of the Delaware River which lies within that state" (*id.*, pp. 231-232),

or approximately 1433 square miles. The water withdrawal thus conceded to the defendant State of New York was, for all practical purposes, the equivalent of 1500 million gallons per day (Record, p. 2797).

This form of compact, although ratified by the Legislature of the State of New York, failed of confirmation by the Legislatures of the Plaintiff and the Intervenor.

With undiminished patience the defendant, State of New York, renewed its efforts, and again, in 1927, the peculiarly skilled and instructed Commissioners of the three States unanimously agreed upon a form of compact (Exhibit 304),

> "to provide for the preservation of the Delaware River and * * * to enable each of the said states to make use of a *part* of the waters thereof for the purpose of meeting present and reasonably prospective needs" (N. Y. Laws of 1927, Cap. 682).

Under the terms of this second form of compact the defendant State of New York was conceded the right to divert for purposes including domestic and municipal water supply, in every calendar year, from any tributary of the Delaware River, or from the channel or from both, within its own boundaries,

> "two hundred nineteen (219) billion gallons, which total quantity is equivalent to an average of six hundred (600) million gallons daily (*id.*, at p. 1715);

This second form of compact, despite its entire reasonableness (see Exhibit 317), likewise failed of confirmation by the Legislatures of the Plaintiff and the Intervenor.

The Special Master has specifically held that he has

> "no hesitation in finding that the need of the City for obtaining an additional water supply is real and imperative and that the effort to obtain an additional supply should not be delayed" (R. S. M., p. 44).

Notwithstanding its eight exceptions under the heading "*Necessity for the Diversion*" (Plaintiffs' Exceptions to the Report of the Special Master, pp. 4-6), the Plaintiff does not except to the above quoted finding of the Special Master, which confirms the statement made at page 8 of

Exhibit 4, under the heading, "THE NEED AND THE RIGHT OF NEW YORK", being the plan in litigation.

The plan of the defendant City is in entire accord with the form of Compact proposed in 1927 (see Exhibit 4, at its p. 4, par [5]).

It is of overwhelming significance (see Exhibit 317), that, amongst the witnesses introduced before the Special Master, were Messrs. J. Waldo Smith and Thaddeus Merriman, the engineers who advised the New York members of the second (1927) compact commission and Messrs. Charles E. Ryder, W. L. Stevenson and Solomon Swaab, the engineers who advised the Pennsylvania members of the said commission; but *the Plaintiff State did not produce any of the engineers* who assisted its compact commissioners, not even Mr. Morris R. Sherrerd, who at the time of the presentation of the testimony in this cause before the Special Master was, and still is, the Chief Engineer of its State Water Policy Commission (Record, p. 56), except Mr. Howard T. Critchlow, who testified merely to the authenticity of Exhibits 316-317, which were the reports submitted by the engineers of the Commissioners representing the several States to the entire commission. The failure of the Plaintiff State to call upon any of its compact engineers to deny the engineering conclusions contained in Exhibits 316 and 317, or to say that new facts, new learning, or anything at all, had changed his previous, unbiased opinion, leads justly to the conclusion that none of them would have altered his previous views, or receded from his accession to the plan now in litigation.

The failure of the Plaintiff to call upon any of its compact engineers to repudiate his recommendations to the Commissioners who represented the State of New Jersey

in the preparation of the 1927 form of compact, by which the defendant City proposes to be guided, is an *outstanding fact*

> "from which the lay mind can safely draw inferences as to the probabilities" (R. S. M., p. 40, quoting North Dakota *v.* Minnesota, 263 U. S. 385),

that the 1927 form of compact is fair, just and equitable, as professionally certified by the compact engineers, between the three States (Exhibits 316, 317).

But apart from such proper inferences as are to be drawn from the failure of the Plaintiff to induce its compact engineers to repudiate the advice which they gave to New Jersey's (1927) compact commissioners, the Special Master after a most exhaustive hearing (R. S. M., p. 2), found adversely to the Plaintiff upon every claim of damage, which it made (see Point I, *supra*, p. 13, and R. S. M., pp. 204-206, pars. 30-38).

To overcome the total (R. S. M., p. 206, par. 39) of trifling damage which the Plaintiff and/or its citizens might sustain the Special Master recommended that the third stage (Exhibit 4, at its p. 15) of the defendant City's development be enjoined (R. S. M., p. 195, R. S. M., p. 209, par. 3). In so doing he departed from the doctrine of the authorities collated in *Connecticut* v. *Massachusetts*, 75 L. Ed. 297, and introduced into the domain of interstate law, an unadvocated doctrine (see R. S. M., p. 209, par. 56), which, if adopted, can only serve to paralyze the endeavors of a great metropolis, within a great State, to preserve itself.

There was testimony before the Special Master, from the lips of an highly qualified engineer (R. S. M., p. 67)

that the proposed New York diversion of the equivalent of 600 million gallons per day (Record, p. 3539) was only about one-half of the possibilities (Record, p. 3542) of the Delaware River in New York, under the Pennsylvania plan; but the Special Master preferred to ignore this highly qualified testimony, in favor of his own unlitigated views.

The Special Master also ignored the fact that the amount of water to be released, from the proposed reservoirs, under the defendant City's plan, and during the dry months, would average 25,380,000,000 gallons (Record, pp. 3537, 2777) in each year, or more than 11½% of the amount proposed to be diverted. That the improving effect of the releases proposed by the defendant City will be vast can best be determined by comparing the above figure of 25,380 million gallons with the figures showing the extreme flashiness of the stream at Port Jervis (R. S. M., p. 62).

That the huge population of the defendant City (*supra*, p. 5) is fairly entitled to draw from the New York tributaries, in question, of the Delaware River the relatively small quantity of water contemplated by the plan in litigation is a matter of strongest appeal to the good conscience of the Court. The Intervenor so concedes (R. S. M., pp. 183, 186). The Plaintiff produced nothing but merest speculations in support of its arrogant claim, the allowance whereof would produce nothing but disaster to the defendant City.

POINT III.

The imposition of the Pennsylvania plan of release upon the taking by the defendant City of only 440 million gallons of water per day is inequitable and unjust.

The defendant City does not recede from or alter the position which it took at pages 268-280 of its brief before the Special Master, where, at page 270 of that brief (referring to the New York and Pennsylvania plans of release of water), it said:

> "The defendant City of New York believes that both the New York and the Pennsylvania plans of release are comparably fair, reasonable and equitable. Each has its advantages and disadvantages * * *.
>
> The differences between the two plans are, however, not sufficiently great to warrant an insistence on the one over the other, in a situation of such outstanding importance and, therefore, the defendant City will not object to a finding based on the Pennsylvania plan of release if it be modified so that the control of the release is at Port Jervis and not at both Port Jervis and Trenton."

The Special Master's preference (R. S. M., p. 195) for the Pennsylvania plan of release existed because that plan

> "is based upon the stage of the Delaware River and not upon the water yield of the diversion area" (R. S. M., pp. 195, 68, 62).

The Pennsylvania plan of release of water is set forth in paragraph 4 (b) of the Special Master's recommendations for decree (R. S. M., pp. 210-211) and is as follows:

"(b). At any time the stage of the Delaware River falls below .50 c. s. m. at Port Jervis, New York, or Trenton, New Jersey, or both (.50 c. s. m. being equivalent to a flow of 1535 c. f. s. at Port Jervis and 3400 c. f. s. at Trenton), water shall be released from one or more of the impounding reservoirs of New York City in sufficient volume to restore the flow at Port Jervis and Trenton to .50 c. s. m., provided, however, that there is not required to be released at any time water in excess of 30% of the diversion area yield, and the diversion area yield having been ascertained to be 2.2 c. s. m., the maximum release required shall be 30% of that amount, or .66 cubic feet per second per square mile of the areas from which water is diverted.

In determining the quantity of water to be released so as to add to the flow of the Delaware River, the Neversink River shall be treated as if it flowed into the Delaware River above Port Jervis, and the number of second feet of water released from the impounding reservoir on the Neversink River shall be added to the number of second feet of water released from other reservoirs, so as to determine whether the quantity of water, required by this decree to be released, has been released."

To quote again from the Special Master (R. S. M., pp. 62-63):

"Under the Pennsylvania plan of releases, water is released from the impounding reservoirs at any time that the flow in the Delaware River at Port Jervis or at Trenton falls below .50 c.s.m. As there are 3070 square miles of drainage area above Port Jervis, therefore .50 c.s.m. at Port Jervis means a flow of 1535 c.f.s., and as there are 6800 square miles of drainage area above Trenton, a flow of .50 c.s.m. at Trenton means a flow of 3400 c.f.s. In other words, whenever the flow of the river at Port Jervis

> is less than 1535 c.f.s or the flow at Trenton is less than 3400 c.f.s., or both, then, under the Pennsylvania plan there is to be released from the impounding reservoirs sufficient water to restore the flow to .50 c.s.m., provided, however, there is not required to be released at any time more than 30% of the average water yield of the diversion area. As the evidence shows the average run off from the diversion area is 2.2 c.s.m., it follows that 30% of this amount is .66 c.s.m., which is the equivalent (for 610 miles of diversion area) of 402.6 c.f.s., and that figure is the maximum release under the Pennsylvania plan."

The undue hardship of this plan, when the defendant City is limited to a draft of the equivalent of 440 million gallons per day is made manifest at page 62 of the report of the Special Master, where he says,

> "the Delaware River is subject to wide variations in flow and is described as a very flashy stream. According to the records of the United States Geological Survey, the flow in the Delaware River at Port Jervis has varied from 92,700 c.f.s. to 175 c.f.s., and at Trenton the flow has varied from 160,000 c.f.s. to 1240 c.f.s. (Exhibit 15)."

Each of the 5 places, at which the defendant City proposes to construct a reservoir, is more than 30 miles from the channel of the Delaware River, where, for approximately 75 miles, it constitutes a boundary between the State of New York and the Commonwealth of Pennsylvania, before touching upon the shores of New Jersey. (See map following p. 22 of Exhibit 4, and R. S. M., p. 53).

According to the Pennsylvania plan, at a time when the gage of the river at Trenton was as low as 1240 c.f.s. (R. S. M., p. 62), the defendant City would be required to release

290.40 c. f. s. (R. S. M., p. 210) from the reservoirs, not disapproved (R. S. M., p. 209) by the Special Master, at a time when the stage of the river at Port Jervis, which is about 120 miles north of Trenton (R. S. M., pp. 53, 139), might be well above its average flow of 5648 c.f.s. (R. S. M., p. 70).

However important to New Jersey the stage of the river between Port Jervis and Trenton (R. S. M., p. 68) may be, it is only a portion of the non-navigable waters above Curry on the Neversink and Downsville on the East Branch (Exhibit 4 at its p. 14) wholly within the State of New York (R. S. M., p. 83) that the Special Master permits to be applied to the essential and most high uses which water can serve (*Connecticut* v. *Massachusetts*, 75 L. Ed. 297, 304).

By providing against the Summer falling off of the stream flow immediately below the points where its dams are to be erected, the defendant City does something more than, in reason, it should be expected to do.

Under what the Plaintiff has described as the Master's plan (Plaintiff's Exceptions to the Report of the Special Master, p. 16), there is imposed upon the defendant City an accountability for the nature-caused deficiencies of the stream not only below Curry and Downsville, wholly within the State of New York, but also for the approximate 75 miles between Hancock and Port Jervis (R. S. M., p. 53), in which it shares ownership of the stream with the Intervenor, without any correlative obligation whatever on the part of the Intervenor.

There is and can be no guarantee that such drafts of water will not be made by the Intervenor Commonwealth of Pennsylvania, upon the tributaries, within its borders, of the Delaware, which empty into the river as it flows between

New York and Pennsylvania for 75 miles (R. S. M., p. 53), as will oblige the defendant City to release 30% of the diversion area yield of water (R. S. M., p. 210) to compensate for waters withdrawn or withheld by Pennsylvania.

So far as the determination of this cause proposed by the Special Master is concerned, neither Pennsylvania nor New Jersey is limited in its prospective and, at present, wholly putative drafts from the river or its tributaries by the Pennsylvania plan. Only the defendants are bound thereby and the Plaintiff and the Intervenor will be at full liberty to make any drafts upon the river which are not prohibited by the War Department, leaving the State of New York in the position of being a mere contributor to their enterprises, without resort, recourse or the right to protest.

With releases determined as proposed by the Special Master according to the flow of the river at Trenton (R. S. M., p. 210), whatever may occur on the 120 miles between Tri-State Rock and Trenton (R. S. M., p. 68), utterly beyond any power of control or regulation by the State of New York, is made a matter of responsibility of the defendants, not even excluding the diversions above Trenton Falls made wholly in New Jersey for the Trenton Power Canal (Record, pp. 3485-3486), and the diversions out of the watershed, about 22 miles above Trenton for the Delaware and Raritan Canal (R. S. M., pp. 24-26), and the diversion wholly in Pennsylvania of waters of the Lehigh River into a canal running from Easton, Pennsylvania, about 27 miles on a straight line above Trenton, to Bristol, Pennsylvania (R. S. M., p. 27), which is about 5 miles downstream from Trenton in the tidal section of the river.

Nothing in the Pennsylvania plan imposes it as a duty either upon Pennsylvania or New Jersey to so regulate

the operations of such purely commercial enterprises as the Wallenpaupack project (Record, p. 3516), affecting a drainage area of 257 square miles (Record, p. 3601), as to have regard for the stages of the river (Record, p. 3592) *at any place.*

As conditions would exist, under the findings of the Special Master, the defendant might, and most probably would, be required to release up to 290.4 c.f.s. (*supra*, pp. 33-34), while the above mentioned commercial enterprise was detaining an equal or even greater amount, until such time as its unrestricted desires commanded their release. What exists in the selected instance above referred to could also exist in the case of a similar (though not presently existing) future power development in New Jersey.

The only protection the Pennsylvania plan affords to the defendants against such liabilities is the limitation of their duty to release waters up to 30% of the diversion area yield [R. S. M., p. 210, par. (b)].

For the purpose of complying with the Pennsylvania plan, the defendant would, on the Intervenor's testimony, have to provide 8% more of storage capacity (Record, pp. 3615-3616), which would involve an additional cost to the defendant City, on the first two stages of the development, of 8% of $48,068,000 (Exhibit 4, at its p. 22), or $3,845,440, in order that the river, at Trenton, more than 200 miles away from the nearest point of storage, might have a volume of water, which at the river's extremely low stage (R. S. M., p. 62) would add no beneficial effect over that conferred by the New York plan, and merely serve to furnish the Plaintiff and Intervenor with a basis for making demands upon the defendant City when conditions at the impounding points indicated that waters need not be released.

POINT IV.

The Special Master erred in recommending that the decree to be entered herein be not final.

It is of high significance that none of the original parties to this suit sought any other decree than one which would finally determine the questions presented for adjudication.

The Special Master, himself, concedes that

> "it is desirable that all questions should be settled and that litigation should be ended * * *" (R. S. M., p. 199),

as has been the practice of this Court, in every case, involving water diversions, that has come before it.

His reasons for leaving this cause unconcluded are set forth at pages 196-197 of his report as follows:

> "Not only is the quantity of releases a very important one but equally important is the definite ascertainment of the time of transit of the released water from the impounding reservoirs to Tri-State Rock. I have already stated the conflict of evidence as to the time of transit and my reason for adopting, *for the present*, the Pennsylvania time of transit [note R. S. M., p. 73] and that in my opinion the final determination of the quantity of water to be released and of the time of transit at various stages of flow must be left to the test of actual practice and experience. NO HARM WILL BE DONE, HOWEVER, BY ADOPTING THE PENNSYLVANIA PLAN OF RELEASE FOR THE PRESENT AND TESTING THAT PLAN DURING THE OPERATION OF THE FIRST DEVELOPMENT AND BEFORE THE SECOND DEVELOPMENT BECOMES EFFECTIVE.

> Only 70 million gallons daily are to be diverted from the Neversink and this diversion will be in operation for a number of years before the larger diversion from the East Branch. During the operation of the Neversink diversion it can be determined with more accuracy than can now be forecast whether the Pennsylvania plan should remain as it is or whether it should be modified. Careful observations of the effect of the Neversink diversion will determine whether .50 c.s.m. is the proper control figure or whether that figure should be raised to .60 c.s.m., or higher. It can also be determined whether one, two or more control points should be adopted and the time of transit at varying stages of water can also be determined. With the result of this experience, the quantity and plan of releases can be determined before the East Branch diversion has begun. The diversion from the Neversink is relatively so small that any factors of error in the Pennsylvania plan of release will have no materially adverse effect. I am therefore of the opinion that the decree fixing the plan of release should be made subject to modifications'' (R. S. M., pp. 196-197).

In effect, what the Special Master proposes is that "The First Stage Of The Development" (Exhibit 4 at its p. 14), planned by the defendant City, be constructed at a cost which will not be less than $210,174,000 (Exhibit 4 at its p. 22, all items except 3 and 4) so that the effectiveness of the Pennsylvania plan [see R. S. M., p. 210, par. (b)] may be determined. This in the face of the fact that

> "The proof of Pennsylvania tended to confirm the proof of the State and City of New York, to the effect that the taking of the equivalent of 600 million gallons daily by the City of New York would not be injurious to New Jersey" (R. S. M., p. 186),

and the Special Master's very obvious aversion for the claims of damage made by the Plaintiff (see R. S. M., pp. 205-206, pars. 32-38).

The defendant City, while it labors under a real need to take immediate steps to increase its water supply (R. S. M., p. 201, par. 16), must do so as inexpensively (R. S. M., p. 202, par. 16), economically (*id.*, par. 17) and safely (*id.*, par. 21) as can be.

The fact that the defendant City did not vehemently oppose

> "the Pennsylvania plan of release if it be modified so that the control of the release is at Port Jervis and not at both Port Jervis and Trenton" (Defendant City's Brief Before Special Master, p. 270),

when the only subject (note, R. S. M., p. 209, par. 56), under examination was the right of the defendant City

> "to take 600 million gallons per day from the watershed in question" (Complaint, p. 13, par. 22, Amended Answer of Defendant City, pp. 21-22, par. 34),

does not justify any conclusion that it is able to, or should, expend $210,174,000 (*supra*, p. 38), for the purpose of ascertaining whether some plan of release other than one of those already submitted or defended by the various parties to this suit will be the better.

No economic course of construction could be adopted which did not provide that

> "the main aqueducts * * * be constructed of sufficient capacity to eventually take the full quantity" (Exhibit 4, at its p. 14)

of water to be diverted to the defendant City. Yet for the sake of meeting objections not urged by any party, the Special Master concludes that the defendant City should engage in the first stage (R. S. M., pp. 196-197) of a huge unitary enterprise, and let the other and more important, from a water supply point of view, stages of the development await a future determination by this Court and, assumably, the education of another Special Master in the technicalities of this case (R. S. M., p. 13).

How

> "the time of transit of the released water from the impounding reservoirs to Tri-State Rock" (R. S. M., p. 196),

could be definitely ascertained (*id*) by the test of actual practice and experience (*id*) with waters entering the Delaware River downstream from Port Jervis (see R. S. M., p. 210, *supra*, p. 32, and map following p. 22 of Exhibit 4), more satisfactorily than by the approximately accurate computations, submitted on behalf of the defendants and the Intervenor (R. S. M., p. 73), which were

> "in substantial accord with the observation of the time of transit * * * made by the United States District Engineer's office at Philadelphia" (R. S. M., pp. 72-73),

presents a question to which there is no practical answer.

The 'Wallenpaupack wave' (R. S. M., p. 72), originating at

> "a power plant located at Hawley, Pennsylvania on the Lackawaxen River, which is a tributary of the

> Delaware, flowing into the Delaware above Port Jervis" (R. S. M., p. 71),

which was the basis of observation of the Intervenor's Engineers (*id*) furnishes a present and more convincing (R. S. M., pp. 72-73), means of determining the time of transit of waters from the intended dams at Downsville, Delhi, Beaver Kill and Parkston than anything that could be determined by observing the river after only (R. S. M., p. 197) 70,000,000 gallons per day had been taken from the Neversink (R. S. M., p. 7). The amount of water released by the Wallenpaupack wave is approximately the same as that to be released under the plan of the defendant City (Record, pp. 3526-3527). That the records based upon the computation of the time of travel of that wave should not be ignored in favor of computations based upon the relatively small (R. S. M., p. 197), releases to be made from the impounding reservoir on the Neversink River (R. S. M., pp. 210-211), is too plain for further discussion.

As the report of the Special Master presently stands, nothing is determined save that the defendant City may not at any time divert in excess of the equivalent of 440 million gallons of water per day, for the purposes of its water supply (R. S. M., p. 209, par. 3), from the Neversink and the East Branch of the Delaware (R. S. M., p. 195), with liberty to the Plaintiff and the Intervenor to come in, *at any time*, even after the defendant City has expended $272,587,000 (Exhibit 4, at its p. 16), and more, on the execution of its plan, as approved by the Special Master, and make it defend against a demand that the control figure (note, R. S. M., p. 195), determining whether releases of water from the impounding reservoirs should

"'be raised to .60 c. s. m., or higher" (R. S. M., p. 196).

The only thing, upon which the defendant City may rely in the decree of the Special Master, as proposed, is uncertainty as to whether, after the work is entirely completed, it will be called upon to increase the storage capacity of reservoirs already erected or to build other reservoirs on other tributaries of the Delaware (R. S. M., p. 198), for the purpose of complying with wholly new requirements of this Court, induced by the Plaintiff or the Intervenor. The uncertainty of the determination proposed by the Special Master extends (R. S. M., p. 212, par. 9), even to the treatment of sewage and industrial waste from Port Jervis and leaves the Plaintiff and the Intervenor free to compel the defendant City, at any time, to overcome the contention that some new standard of purity of the waters of the river at Port Jervis should be adopted, or some other methods of sewage and waste disposal, than that presently favored by the Special Master, be installed. The defendant City has, and should have, no power over Port Jervis. But under the findings made and decree proposed by the Special Master, there is imposed upon it an unending anxiety lest its necessary and costly operations be halted because of conditions existing and arising wholly within that distinct municipality.

The "without prejudice" denial, as suggested by the Special Master, of the Intervenor's proposal of the appointment of a River Master is peculiarly inept. The Plaintiff contended before the Special Master that the

> "Intervenor's suggestion of a River Master is preposterous" (Plaintiff's Brief Before the Special Master, p. 321).

The defendant City was content to show that there was no necessity for any such appointment.

In his discussion of this question the Special Master expressed the view that there was no reason to doubt that the defendants would faithfully observe the terms of the decree to be entered herein, and that the appointment of a River Master would be unnecessary (R. S. M., p. 192). What any such functionary would be called upon to do, which could not as well be done, by the proper officials of the various parties to this controversy is not, at all, discernible. There is no power which this Court could give to a River Master and the known disinclination of the Court to retain perpetual jurisdiction of any litigation (Record, pp. 3221-3223) should have led the Special Master to deny the application of the Intervenor for the appointment of a River Master, *with finality.*

Similarly it was error for the Special Master to recommend that this case be retained in Court (R. S. M., p. 212, par. 9) for the purpose of permitting the Intervenor to apply THEREIN for an allotment to it of the equivalent of 750 million gallons of water per day from the Pennsylvania tributaries of the Delaware (R. S. M., pp. 206-207). The defendant City does not contend that the Intervenor is not entitled to withdraw that amount of water from the tributaries of the Delaware, within its own borders, or from the channel of the river. The insistence of the defendant City is that this suit should not be kept open for any such merely possible purpose.

In closing under this point it is submitted that the interests of the defendant City at stake are too large to permit of any uncertainty in the decree to be entered, so large indeed, from every point of view, that it cannot experiment,

and that nothing but a decree definite and final in all its particulars would warrant it in embarking upon its project, here in litigation.

POINT V.

The Delaware River is not a navigable stream above Port Jervis.

In his 25th finding of fact (R. S. M., p. 203) the Special Master found:

> "25. The Delaware River from Trenton Falls to Hancock, New York, and beyond to undefined points in the East Branch and West Branch, was navigated during the last century and before, and carried considerable commerce. IT IS NOT NOW NAVIGATED FOR COMMERCIAL PURPOSES AND IS UNSUITED TO MODERN METHODS OF WATER TRANSPORTATION. The only navigation at the present time is by motor boats and canoes for pleasure purposes and for short distances. The river, however, is navigable in fact and, therefore, navigable in law under the decisions of this court."

It is assumed that the Plaintiff in its brief in support of its exceptions 18-23 (Plaintiff's Exceptions to the Report of the Special Master, pp. 7-8) will reproduce its summary, as contained at pages 38-42 of the brief which it submitted to the Special Master, of the testimony of its raftsman witnesses, Fish, Tompkins, Leonard, Spencer, Peck, Moreland, Realy, Shepheard and Persbacker, who deposed to the floating downstream, only, from points north of Port Jervis, of rafts.

At the present time the rafts have disappeared (R. S. M., p. 83) from the river.

> "The mere fact that logs, poles and rafts are floated down a stream occasionally and in times of high water does not make it a navigable river."
>
> *U. S.* v. *Rio Grande Dam and Irrigation Company,* 174 U. S. 690, cited with emphasis at R. S. M., p. 76.

The rafts, about which the above-named witnesses testified, came down during the spring and fall floods (R. S. M., p. 81). No rafts ever went up the river.

> "A greater capacity for practical and beneficial use in commerce is essential to establish navigability."
>
> *Oklahoma* v. *Texas,* 258 U. S. 574, 591.

The very most that the testimony of the Plaintiff's witnesses established was that from Port Jervis to undefined points to the North, the river is a floatable, as distinguished from a navigable, stream (*Gerish* v. *Brown,* 51 Me. 256, 81 Am. Dec. 569, 570; *Burner* v. *Nutter,* 77 W. Va. 256, 87 S. E. 359, 361). It is not to be thought that a stream which is

> "unsuited to modern methods of water transportation" (R. S. M., p. 203, par. 25; *supra,* p. 44),

will again become a source of water travel downstream only, by rafts, replacing those which have disappeared (R. S. M., p. 83). Under what are now

> "the customary modes of trade and travel on water" (*U. S.* v. *Holt Bank,* 270 U. S. 49, 56),

the Delaware River north of Port Jervis is not a stream which, by any stretch of a vivid imagination, can be said to afford

"a channel for useful commerce" (*id.*).

Its alleged navigability, if it ever really had any, has become a matter of mere history (R. S. M., p. 82) not because of any artificial obstructions or correctible natural changes (see *Economy Light Co.* v. *U. S.*, 256 U. S. 113, 118), but because man, in his progress, has found means of transportation which make the stream unequal to his needs. Not being equal to man's needs, the stream is not navigable water of the United States, except to one whose mind dwells with the antiquities of forgotten history, rather than amongst the actualities of the present.

The brief for the Plaintiff in *United States* v. *Utah* (No. 14, Original, October Term, 1930), argued February 25th, 1931, discusses fully the question of navigability of such streams as the Delaware River between Port Jervis and Hancock, and demonstrates, in our opinion, that they are not navigable waters. No discussion of the precedents cited in said case by the Solicitor General will be added hereto, because the question, in the case at bar, as to navigability of the river between Port Jervis and Hancock is of but minor importance (see R. S. M., p. 94). This point is included in this brief merely in order to avoid any subsequent holding, on the authority of this case, that the Delaware River, upstream from Port Jervis, is a navigable stream.

Conclusion.

The findings, conclusions and recommendations of the Special Master should be revised by the Court, in accordance with the foregoing Points, and a decree entered finally dismissing the bill of complaint herein, and finally dismissing the applications of the Intervenor for the appointment of a River Master, and to keep this litigation unconcluded for the purpose of enabling it to apply therein for the allocation to it of waters of the Delaware River.

Respectfully submitted,

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CHARLES ELMORE

IN THE

Supreme Court of the United States

OCTOBER TERM, 1930.

No. 1[redacted]Origin[redacted] 98

STATE OF NEW JERSEY,
Plaintiff,

v.

STATE OF NEW YORK and CITY OF NEW YORK,
Defendants.

COMMONWEALTH OF PENNSYLVANIA,
Intervenor.

BRIEF FOR COMMONWEALTH OF PENNSYLVANIA, INTERVENOR.

WILLIAM A. SCHNADER,
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IN THE

Supreme Court of the United States

OCTOBER TERM, 1930. ORIGINAL No. 16.

State of New Jersey, Plaintiff,

v.

State of New York and City of New York, Defendants.

Commonwealth of Pennsylvania, Intervenor.

BRIEF FOR COMMONWEALTH OF PENNSYLVANIA, INTERVENOR.

INTERVENOR'S STATEMENT OF CASE.

A. Intervention of Commonwealth of Pennsylvania pro interesse suo.

The Delaware River is an interstate stream rising in the highlands of New York and constituting the

boundary between the State of New York and the Commonwealth of Pennsylvania from a point near Deposit, New York, to a point near Port Jervis, New York, known as Tri-State Rock. From that point southwardly to a point near Chester, Pennsylvania, the Delaware River constitutes the boundary between the State of New Jersey and the Commonwealth of Pennsylvania.

Above Trenton, New Jersey, the Delaware River drains an area of 6,800 square miles, of which total 2,389 square miles or 35% are within the State of New York, 976 square miles or 14% are within the State of New Jersey, and the remaining 3,435 square miles or 51% are within the Commonwealth of Pennsylvania. The catchment area of the Delaware River above the Delaware-Pennsylvania state line is 10,444 square miles of which total 2,389 square miles are within New York, 1,979 square miles are within New Jersey, and the remaining 6,076 square miles are within Pennsylvania.

The City of Philadelphia and Eastern Pennsylvania are vitally interested in the waters of the Delaware River and any allocation thereof. This populous and highly industrialized community has for many years obtained its water supply largely from this interstate stream; and as it grows and prospers, will necessarily depend upon this river to meet its ever increasing need of water for domestic, municipal, sanitary and industrial purposes.

Moreover, Philadelphia and Eastern Pennsylvania must eventually procure their future water supply

in large part from the Pennsylvania tributaries of the upper Delaware River. To that end, the Sanitary Water Board of Pennsylvania has already classified these tributaries as "Class A" streams, suitable for a domestic and municipal water supply. But these Pennsylvania tributaries, together with the New York and New Jersey tributaries of the upper Delaware River, comprise a water supply area that is competitive because it is equally available to all three States and the amount of water divertible therefrom is ultimately limited.

Nevertheless, with proper control and regulation, the Pennsylvania, New York and New Jersey tributaries of the upper Delaware River can respectively supply the present and reasonable future water demands of all three States. And, if wasteful competition for these tributaries be eliminated by a present fair and equitable allocation of their waters, then Philadelphia and Eastern Pennsylvania will be free to develop first, as is the most economic manner, the limited nearby sources and eventually the Pennsylvania tributaries of the upper Delaware River.

When the present original proceedings were instituted, it at once became imperative that the Commonwealth of Pennsylvania as *parens patriae* should intervene in order to assert and protect the rights and interests of Philadelphia and Eastern Pennsylvania in the waters of the Delaware River and its Pennsylvania tributaries as a present and future source of water supply.

The Commonwealth could under no circumstance

intervene as party plaintiff because the basic principle of the New Jersey bill, *i. e.*—that the common law rule of riparian rights governed the division and use of the waters of the Delaware River and its tributaries, and that under said rule its citizens had a vested property right to enjoy those waters "without diminution or alteration,"—was subversive of the right of Philadelphia and Eastern Pennsylvania to continue their development and use of the Delaware River and its Pennsylvania tributaries as a present and future source of water supply. If New Jersey by invoking the common law rule of riparian rights could stop New York from diverting water for water supply purposes from the New York tributaries of the Delaware River, it could likewise prevent Philadelphia and Eastern Pennsylvania from taking water from this river and its Pennsylvania tributaries to supply their present and future reasonable needs.

On the other hand, it was against the interest of Pennsylvania to intervene as party defendant because, if New York was granted leave by this Court to divert water from the Delaware River for water supply purposes under the doctrine of fair and equitable apportionment, it then became of the utmost importance that such a diversion should be so conditioned as (1) to protect and safeguard the present and future rights and interests of Philadelphia and Eastern Pennsylvania in the waters of the Delaware River and its Pennsylvania tributaries and (2) to preclude New York from presently diverting more

than its fair and equitable share in the waters of that river. Obviously, a diversion at will and without restriction from the New York tributaries of the upper Delaware River might deprive Philadelphia and Eastern Pennsylvania not only of their fair and equitable share of water from the Delaware River and its Pennsylvania tributaries but also of their reasonable use thereof.

The Commonwealth of Pennsylvania, therefore, as *parens patriae* representing the interest and welfare of all of its citizens resident in the basin and watershed area of the Delaware River and its Pennsylvania tributaries and dependent upon the waters of that river and those tributaries for their present and future needs, presented its petition to this Court for leave to intervene *pro interesse suo* in the present original proceedings. The petition was vigorously opposed by New Jersey and New York, who endeavored to compel Pennsylvania to intervene either as a party plaintiff or defendant; but this Court on January 6, 1930, granted the prayer of the petition, providing the Intervenor filed a statement of interest and the relief, if any, desired.

B. Intervenor's statement of interest and relief desired.

The Commonwealth of Pennsylvania, as Intervenor, accordingly prepared and filed in this Court its statement of interest and relief desired, which avers the following (R. 4593-97):

1. Pennsylvania is interested in developing the waters of the Delaware River and its tributaries "through regulated control of storage and release of waters from impounding dams which will tend toward reduction of flood flows and increase of low water flows, and bring about the maximum utilization of said water resources for domestic and municipal water supply and sanitation, industrial water supply and the development of water power."

2. The City of Philadelphia and many other municipalities in Eastern Pennsylvania now obtain their water supply from the Delaware River and its tributaries and in the future will continue to draw their increased water supply from that source.

3. The City of Philadelphia has long recognized the necessity of procuring its future water supply from above the head of tide and from the Pennsylvania tributaries of the upper Delaware River.

4. An application of the principles set forth in New Jersey's bill of complaint will prevent the City of Philadelphia and other Eastern Pennsylvania municipalities from developing and using the Pennsylvania tributaries of the upper Delaware River above the head of tide water as a future source of water supply.

5. Pennsylvania desires to intervene, to cross-examine witnesses and to present testimony if necessary upon whether New York's proposed impounding

and diversion of water from certain New York tributaries of the Delaware River is in accordance with a fair and equitable division of the waters of that river between the three States; and whether said proposed impounding and diversion will cause material damage to the Commonwealth of Pennsylvania, its municipalities and inhabitants; and whether New York's plan for the release of impounded waters is adequate for the maintenance of the flow of the Delaware River in periods of low flow.

6. Pennsylvania desires that the proposed diversion by New York City shall not constitute a prior appropriation but shall be included as an integral part of New York's share in the waters of the Delaware River in any present or subsequent or final allocation of such waters between the three States; and that the right of Pennsylvania to its fair and equitable share of the waters of the Delaware River and its tributaries shall not be infringed by any adjudication in the pending controversy.

7. Pennsylvania desires relief against the proposed diversion by New York City, if upon the hearing of the cause it develops that the proposed diversion (*a*) is not in accordance with a fair and equitable division of the waters of the Delaware River between the three States or (*b*) will cause material damage to the present and reasonable future water needs of the City of Philadelphia and Eastern Pennsylvania or (*c*) does not contemplate a proper release of impounded waters for the purpose of increasing

the low water flow of the Delaware River or (*d*) shall constitute a prior appropriation which should not be taken reasonably into account in any subsequent or final allocation of the waters of the Delaware River between the three States.

C. The issues raised by Pennsylvania's intervention; and the disposition thereof by the Special Master.

The fundamental issue raised by Pennsylvania's intervention as well as by the New Jersey bill and the New York answer is what principle of law shall govern the division and use of the waters of the Delaware River and its tributaries. Pennsylvania contends that in the absence of material damages these waters are to be fairly and equitably apportioned between the three States, whereas New Jersey denies this doctrine of apportionment and maintains that these waters cannot be diverted or abstracted save and except for common law riparian use.

The Special Master specifically decided that the doctrine of fair and equitable apportionment is the principle to be applied in the division and use of the waters of the Delaware River and its tributaries and that this principle is in accord with interstate common law (R. 4945-46).

The intervention of Pennsylvania raises the further proposition of law that the proposed diversion by New York City shall not constitute a prior appropriation but shall be chargeable against New York's fair and equitable share in the waters of the Delaware

River and its tributaries. This self evident corollary to the doctrine of fair and equitable apportionment is not gainsaid or contested by either New York City or State.

The Special Master unqualifiedly adopted this secondary proposition of law and held that the mere fact that the State and City of New York are first in point of time in taking water from the tributaries of the Delaware River gives no superiority of right (R. 4950).

Four major issues of fact are raised by Pennsylvania's intervention and the proofs adduced in support of its statement of interest and relief desired. These issues are:

1. The superiority of the Pennsylvania plan of impounding and release under all conditions of taking.

2. The absence of material damage, if all takings of water from the tributaries of the upper Delaware River be under the Pennsylvania plan of impounding and release.

3. The advisability of appointing a Delaware River Master to regulate and control the taking of water under the Pennsylvania plan of impounding and release.

4. The necessity for a present allocation of Pennsylvania's fair and equitable share in the waters of the Delaware River and its Pennsylvania tributaries.

The Special Master upheld the superiority of the Pennsylvania plan of impounding and release and applied its principle to the extent that New York City is permitted under his Report to divert water from the New York tributaries of the Delaware River (R. 4951). He denied without prejudice the contention of Pennsylvania that its plan of impounding and release govern the future as well as the present taking of water from the Delaware River and its tributaries, and in particular be applied to Pennsylvania and New Jersey if and when they adopt plans for any such taking of water (R. 4951).

In passing upon the question of damages, the Special Master confined his findings to the proposed diversion of 600 m.g.d. by New York City and found that the diversion of that quantity will cause substantial damage to New Jersey and its citizens, which damage is more than New Jersey is required to bear under an equitable apportionment of the waters of the Delaware River (R. 4966-67). Consequently he recommended that the New York diversion be limited in quantity to 440 m.g.d. (R. 4967).

The Special Master dismissed without prejudice the proposal of Pennsylvania that a Delaware River Master be now appointed by this Court in order that the Pennsylvania plan of impounding and release may be more effectively operated (R. 4951-52). He pointed out that this proposal is not only beyond the scope of relief asked in Pennsylvania's pleading but is also premature because there will be no actual taking of water from a New York tributary of the Delaware River for probably the next ten years (R. 4951-52).

The Special Master also dismissed without prejudice the contention of Pennsylvania that Philadelphia and Eastern Pennsylvania be presently allotted their fair and equitable share of 750 m.g.d. in the waters of the Pennsylvania tributaries of the upper Delaware River in order to avoid wasteful competition for that tri-state water supply area (R. 4946-50). He is of the opinion that until a definite project or plan to resort to the Pennsylvania tributaries of the upper Delaware River has been formally adopted and approved by the proper state authorities, this Court lacks authority and jurisdiction to make the desired allotment because Pennsylvania is in substance asking for a declaratory judgment of its rights (R. 4949-50). He further stated that Pennsylvania is in this regard asking for an adjudication not embraced within its statement of relief but apparently does not attach much importance to this highly technical objection (R. 4946).

The Commonwealth of Pennsylvania has filed no exceptions to the Report of the Special Master because the rights and interests of Philadelphia and Eastern Pennsylvania in the waters of the Delaware River and its Pennsylvania tributaries are adequately protected for the time being by his recognition and application of the interstate common law doctrine of equitable apportionment to the division and use of said interstate waters and by his adoption and application of the principle of the Pennsylvania plan of impounding and release to the present New York taking. As we shall later demonstrate, the adoption

and application of the Pennsylvania plan of impounding and release by the Special Master guaranteed the protection of all downstream interests against substantial damage not only when New York City and State are presently taking Delaware River water but later when all three States are claiming their fair and equitable shares of water from that river. This guarantee against future as well as present damage is of prime importance to the Commonwealth, since it removes any possible objection from New Jersey and New York to Philadelphia and Eastern Pennsylvania later claiming their aliquot share of water from the relatively pure Pennsylvania tributaries of the upper Delaware River.

In addition, the recommendation of the Special Master that this Court retain jurisdiction over the present cause in order to permit, *inter alia,* the Commonwealth to renew at an appropriate future time its application for the judicial appointment of a Delaware River Master and also its application for a judicial allocation of Pennsylvania's fair and equitable share in the waters of the Delaware River and its Pennsylvania tributaries will afford to the Intervenor ample opportunity thus to secure the remaining protection that it seeks for the rights and interests of its citizens in the interstate waters of the Delaware River and its tributaries.

The Commonwealth of Pennsylvania therefore stands before this Court as an appellee-intervenor, insofar as the Report of the Special Master affirms the several propositions of law and issues of fact raised by its intervention.

II. ARGUMENT.

A. Preliminary Statement.

Having filed no exceptions on its own behalf, the Commonwealth of Pennsylvania is interested solely in those exceptions that attack the findings and conclusions of the Special Master upon the several issues of fact and law raised by its intervention. The argument of the Intervenor will therefore discuss (1) the applicability of the interstate common law doctrine of fair and equitable apportionment, (2) the superiority of the Pennsylvania plan of impounding and release, (3) the absence of material damage under that plan, and (4) the necessity for a retention of jurisdiction by this Court over the present cause.

Under the first heading, which is concerned with the primary law question of what principle shall govern the division and use of the waters of the Delaware River and its tributaries, there will be a brief but full discussion not only of the decisions of this Court but also of the cogent reasons that led the Special Master to reject the common law rule of riparian rights and to apply the doctrine of equitable apportionment. New Jersey alone has excepted to this conclusion of the Special Master.

The second and third headings involve two closely related issues of fact, upon which depend not only the protection of Pennsylvania's interests against damage from the present New York taking, but also the feasibility of a future water supply for Philadelphia and Eastern Pennsylvania from the Pennsylvania tributaries of the upper Delaware River. Both head-

ings are assigned as error by New Jersey as well as by New York City and State; and it will therefore be necessary to make an extended and exhaustive analysis of the Pennsylvania proofs regarding these issues of fact and the findings and recommendations of the Special Master thereon.

The fourth and last heading mainly embodies certain issues of fact and law raised by Pennsylvania's intervention but not finally disposed of by the Special Master. New York City and State have alone taken exception to this recommendation by the Special Master.

B. The Special Master committed no error in applying the interstate common law principle of equitable apportionment to the division and use of the waters of the Delaware River.

What this Court decrees regarding the division and use of the interstate waters of the Delaware River and its tributaries is a legal matter of the gravest moment to the Commonwealth of Pennsylvania, because, unlike New Jersey and New York, it has no intrastate streams to satisfy the water requirements of its citizens. Due to its landlocked position, every river system within its borders is perforce an interstate stream, such as the Delaware River.

Pennsylvania has up to the present solved its water exigency by making use of interstate streams within its borders. This use has not been in excess of the reasonable needs of its population or in violation of the rights of its sister States. The Intervenor must in the future continue to use its interstate waters to meet the reasonable demands of its citizens.

The Delaware River, like every other interstate stream, consitutes but a single stream throughout its entire course. Each State, through which it flows, should enjoy the fundamental right to use a reasonable portion of its waters for the benefit of its citizens.

New York, as the upper riparian state, ought not to use or divert water from the Delaware River and its New York tributaries, as she chooses and regardless of injury to her sister States. Nor should New Jersey, as a lower riparian state, insist that this interstate stream shall forever flow "without alteration and

diminution," thus depriving the other boundary States of any beneficial use of its waters.

Comity, as well as equality of rights between States, require that the sovereignty of each State over interstate waters within its confines shall be limited and circumscribed by the principle of reasonable use by all interested States pursuant to a fair and equitable apportionment. The Commonwealth of Pennsylvania has always proclaimed and practised this rule.

The adoption of any other policy by this Court respecting the division and use of interstate streams will irreparably injure Philadelphia and Eastern Pennsylvania. Their continued growth and prosperity are inextricably predicated upon the procurement from the Delaware River and its Pennsylvania tributaries of water, adequate in quantity and suitable in quality, to take care of their present and reasonable future needs.

Fortunately for Philadelphia and Eastern Pennsylvania, the law laid down by this Court regarding the division of the benefits of interstate streams is in strict accord with Pennsylvania's water policy of fair and equitable apportionment. The Special Master decided after a most careful review of the then decisions by this Court in the cases of **Kansas v. Colorado, 206 U. S. 46 (1907), Wyoming v. Colorado, 259 U. S. 419 (1922)** and **Wisconsin v. Illinois, 278 U. S. 367 (1929),** that in a controversy between States over interstate waters this Court is not bound by the local law but applies a so-called interstate common law, which is founded upon federal, state or international

law as the occasion demands; that the doctrine of equitable apportionment of the waters of an interstate stream is a sound principle of that interstate common law; and that reasonable diversions to another watershed are permitted under that interestate common law, subject only to the limitation that damage of a serious magnitude must not be thereby caused to a sister State (R. 4786-87).

The first group of New Jersey exceptions attack these conclusions of law by the Special Master and ask this Court to apply the alleged local law of riparian rights to the division and use of the interstate waters of the Delaware River among the three litigant States. In support of their exceptions counsel for New Jersey argue that there is no such thing as "interstate common law" and that there can be no federal law applicable to the present controversy. They further argue that the doctrine of equitable apportionment is but another name for the western rule of appropriation, so that the effect of the Special Master's conclusion regarding interstate common law is to apply the minority rule of appropriation, heretofore applied only to peculiar conditions of climate and soil, to States where those peculiar conditions never existed and which have never recognized any rule other than that of riparian rights.

We cannot understand how New Jersey counsel can possibly misconstrue the clear and unambiguous language of Justice Brewer in **Kansas v. Colorado** *(supra)* and of Mr. Justice Butler in the most recent case of **Connecticut v. Massachusetts** *(9 Adv. Op. 297,*

1930 Term) into a denial of the existence of interstate common law, the guiding principle of which is equitable apportionment in respect of the use of interstate waters by contending States. Nor can we comprehend the apparent confusion by New Jersey counsel of the interstate common law doctrine of equitable apportionment with the wholly unrelated western water rule of prior appropriation.

The fallacy of these New Jersey contentions is twofold, namely: (1) that this Court in deciding interstate water disputes is never bound by local law, but equitably apportions the use of such waters on the basis of equality of right between States; and (2) the local rule of riparian rights is not common to all three States because Pennsylvania has always applied the civil and not the common law to its large navigable streams, such as the Delaware River.

Unfortunately for the New Jersey argument that this Court must apply the alleged local law of riparian rights to the present controversy, the interstate common law principle of equitable apportionment was reaffirmed and followed by this Court in a case on all fours with the instant suit and only decided since the filing of the Report of the Special Master. That case is

Connecticut v. Massachusetts, U. S. (1931).

This was an original suit by the State of Connecticut to enjoin a proposed diversion of water from the Connecticut River watershed for the purpose of

augmenting the water supply of Boston and its metropolitan area. Both Connecticut and Massachusetts recognized the common law doctrine of riparian rights; and Connecticut, like New Jersey in the instant case, insisted that under this doctrine its citizens had a vested property right in the use of the waters of an interstate stream, which entitled them to have the natural flow continue undiminished in quantity and unimpaired in quality.

In dismissing this unsound contention of Connecticut, Mr. Justice Butler discussed at length the above cited earlier decisions of this Court and held that the guiding principle in controversies between states over the division and use of interstate waters should be the doctrine of equitable apportionment. The following language is from his opinion:

(pp.) **"Connecticut suggests that, under the common law in force in both States, each riparian owner has a vested right in the use of the flowing waters and is entitled to have them to flow as they were wont, unimpaired as to quantity and uncontaminated as to quality.** It maintains that the taking of waters from the Ware and Swift infringes vested property rights in that State which cannot be taken without its consent against the will of the owners. And it insists that this Court, following the law enforced by each of the States within its own boundaries, should grant injunction against any diversion from the watersheds of these rivers.

"But the laws in respect of riparian rights that happen to be effective for the time being in both States do not necessarily constitute a dependable

guide or just basis for the decision of controversies such as that here presented. The rules of the common law on that subject do not obtain in all the States of the Union, and there are variations in their application. The doctrine of appropriation prevails in some States. And every State is free to change its laws governing riparian ownership and to permit the appropriation of flowing waters for such purposes as it may deem wise. United States *v.* Rio Grande Irrigation Co. 174 U. S. 690, 702.

"For the decision of suits between States, federal, state and international law are considered and applied by this Court as the exigencies of the particular case may require. The determination of the relative rights of contending States in respect of the use of streams flowing through them does not depend upon the same considerations and is not governed by the same rules of law that are applied in such States for the solution of similar questions of private right. Kansas *v.* Colorado, 185 U. S. 125, 146. And, while the municipal law relating to like questions between individuals is to be taken into account, it is not to be deemed to have controlling weight. As was shown in Kansas v. Colorado, 206 U. S. 46, 100, such disputes are to be settled on the basis of equality of right. But this is not to say that there must be an equal division of the waters of an interstate stream among the States through which it flows. It means that the principles of right and equity shall be applied having regard to the 'equal level or plane on which all the States stand,' in point of power and right, under our constitutional system' and that, upon a consideration of the perti-

nent laws of the contending States and all other relevant facts, this Court will determine what is an equitable apportionment of the use of such waters. Wyoming *v.* Colorado, 259 U. S. 419, 465, 470."

The foregoing decision of this Court establishes beyond peradventure that the Special Master committed no error in applying the interstate common law doctrine of equitable apportionment to the division and use of the interstate waters of the Delaware River and its tributaries. Our subsequent discussion of the Pennsylvania proofs will clearly show that the present application of this guiding principle is not only in consonance with right and equity but also affords the only possible solution to the pressing water problems of all three States.

The best evidence of the inherent wisdom and fairness of this interstate common law doctrine of equitable apportionment is the practical impossibility of applying the common law rule of riparian rights to interstate streams, like the Delaware River. In recognition of this impossibility the Special Master stressed in his Report the present water policy of each State, under which policy the diversion of water for municipal water supply purposes has long been permitted (R. 4770-71). The compelling reason behind such a water policy is unmistakable.

Upon the comparatively recent growth and development of large cities and vast industries in each State, the common law rule of riparian rights had

to be substantially modified or supplanted in order to provide intrastate water for their dominant needs. Legislation was thereupon enacted that conferred the express right and power to condemn water for this paramount public use in derogation of the rights of riparian owners.

The same dire necessity that forced each of the three States thus to modify or supplant common law riparian rights now urgently exists with reference to the division and use of the interstate waters of the Delaware River and its tributaries. The metropolitan areas of Southern New York, Northern New Jersey and Eastern Pennsylvania require each year an ever increasing supply of water for their dense populations and many industries.

That paramount need cannot be satisfied by common law riparian use as above modified or supplanted, because the power of eminent domain in each State cannot transcend its borders and bind a sister State. And yet this dominant need must not be limited by arbitrary state lines, drawn without reference whatever to this commanding problem of the present day.

Since the litigant States have not seen fit to subject by compact their respective sovereignties to this higher interstate water need, and since the sovereignty of each State prohibits the application of this modification to common law riparian rights in favor of its own citizens and against the citizens of a sister State, the only water policy that can possibly meet the exigency of the present situation is the principle

of reasonable use in accordance with a fair and equitable apportionment.

It will not therefore do for New Jersey to argue that the common law rule of riparian rights should be applied to the present controversy because they are peculiarly adapted to the conditions and needs of all three States. However apposite they may have been in earlier days, common law riparian rights patently cannot solve or even begin to cope with the interstate water problems of populous and highly industrialized communities such as are found in Eastern Pennsylvania. If the common law is static and is incapable of any growth, as New Jersey counsel have argued in their brief, then it must not be permitted to block a fair and just solution of modern water problems but must yield to the interstate common law doctrine of equitable apportionment which can alone solve these water problems in consonance with right and equity and upon the basis of equality of right between sovereign States.

The other major reason why the common law rule of riparian rights should not be applied as the fair and equitable basis for the division and use of the interstate waters of the Delaware River and its tributaries is that the Commonwealth of Pennsylvania has never applied that rule to its large interstate rivers, including the Delaware. The local Pennsylvania law respecting such interstate waters has always been the civil and not the common law.

This Court at an early date recognized that Pennsylvania had departed from the doctrine of common

law riparian rights, when dealing with the waters of the Delaware River; and its decision in the case of

Rundle et al. v. Delaware and Raritan Canal Co., 55 U. S. 79 (1852),

has never been overruled. The appellants therein complained that the appellee canal company had in violation of their earlier mill rights erected a dam upstream and was diverting water from the Delaware River. Upon demurrer, the trial court held that there was no cause of action.

Upon appeal, this Court affirmed the judgment; and the opinion by Justice Grier discussed the local civil rule of Pennsylvania as follows:

> (p. 89) "It is evident, that the extent of the plaintiff's rights as a riparian owner, and the question whether this proviso operates as the grant of a usufruct of the waters of the river, or only as a license or toleration of a nuisance, liable to revocation or subordinate to the paramount public right, must depend on the laws and customs of Pennsylvania, as expounded by her own courts. It will be proper, therefore, to give a brief sketch of the public history of the river and the legislative action connected with it, as also of the principles of law affecting aquatic rights, as developed and established by the courts of that state.
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> * * * * * * *
>
> (pp. 90-91) **"The law of Pennsylvania, by which the title and rights of the plaintiffs must be tested, differs materially from that of England, and most**

of the other States of the Union. As regards her large fresh-water rivers, she has adopted the principles of the civil law. In the case of Carson *v.* Blazer, the Supreme Court of that State decided, that the large rivers, such as the Susquehanna and Delaware, were never deemed subject to the doctrines of the common law of England, applicable to fresh-water streams, but that they are to be treated as navigable rivers; that the grants of William Penn, the proprietary, never extended beyond the margin of the river, which belonged to the public, and that the riparian owners have therefore no exclusive rights to the soil or water of such rivers *ad filum medium aquae.*"

This Court cited with approval the **Rundle** case in the later decision of **Lindsay and Phelps Company v. Mullen, 176 U. S. 126 (1900),** at pages 152-54. Counsel for New Jersey in their brief deliberately omit all reference to the **Rundle** case and repeatedly assert that the common law rule of riparian rights prevails in Pennsylvania respecting the waters of the Delaware River. Of course, this is not so; but it would not do for them to admit that the civil law rule is applied by the Commonwealth to this river, because such an admission would completely destroy their only attempted distinction of the **Connecticut v. Massachusetts decision.**

New Jersey counsel seek to destroy the binding force of that most recent decision by arguing that this Court is not now confronted, as it was in the

Connecticut case, with the necessity of settling an interstate water dispute between States having no common water policy or rule, because all three States do have the same common law rule of riparian rights, and hence this Court would not be justified, as it was in the **Connecticut** case, in taking a step forward and applying the doctrine of equitable apportionment in settlement of the present controversy. The difficulty inherent in this attempted distinction is its unsound major premise that the Commonwealth of Pennsylvania follows the common law rule of riparian rights, when dealing with the waters of the Delaware River.

The Special Master pointed out in his discussion of the inapplicability of the common law rule of riparian rights the further fact that all three States have long permitted a diversion of Delaware River water for canal purposes (R. 4772-76). It is uncontradicted that New Jersey and Pennsylvania are now diverting water from the Delaware River and its tributaries for canal purposes; and that New Jersey does not return all of the water to the Delaware River watershed (R. 3096-98, 3112-17). In the past, New Jersey and New York have diverted water for canals now abandoned and gave no heed to the fact that the water ultimately found its way into another watershed (R. 3098-3100, 3117-23).

In an attempt to avoid the successful invocation of these canal diversions as a precedent for the proposed New York diversion, counsel for New Jersey erroneously state that they were instances of purely

internal sovereign management which had no extra-territorial effect. How the permanent upstream diversion of Delaware River water for canal purposes can have no extra-territorial effect is not explained by New Jersey counsel. If the statement were true, then the proposed permanent diversion from New York tributaries for water supply purposes will perforce have no extra-territorial effect; and if that be true, New Jersey has no present cause of complaint.

The Special Master attached great significance to the consistent disregard of common law riparian rights by all three States for many years, insofar as said rights pertain to the Delaware River; and considered this indication of the water policy of each State as an added reason why common law riparian rights could not now be invoked as the governing principle for the division and use of water from the Delaware River (R. 4770-76). Particularly is this true, since the future enforcement of that principle will work untold hardship upon all concerned and will be subversive of the civil law rule of Pennsylvania.

The Commonwealth of Pennsylvania submits that the foregoing decisions and reasons fully justify the rejection by the Special Master of the common law rule of riparian rights, as advanced by New Jersey, and his adoption and application of the interstate common law doctrine of equitable apportionment, for which the Intervenor contended. Having adopted and applied the doctrine of equitable apportionment, the Special Master was bound to recognize as a matter of law the corollary proposition that no boundary

state should in good conscience and equity be allowed to obtain more than its fair and equitable share in the interstate waters of the Delaware River and its tributaries.

This corollary proposition has never been questioned by New York City and State at any stage in this proceeding; and it was therefore to be expected that no exception would be taken by them to the affirmance of this point of law by the Special Master, when he decided that the present New York taking gave no superiority of right (R. 4950). Since no exception has been assigned to this conclusion, further discussion of its soundness seems wholly unnecessary.

There remains but one further question of law to be discussed under this section of our brief, and that is the legal limitation that the division and use of interstate waters must not cause damage of serious magnitude. This solitary limitation upon the doctrine of equitable apportionment is fully conceded by all parties and their counsel; and was laid down and followed not only by the Special Master in the present case (R. 4786-87) but also by Mr. Justice Butler in the most recent case of **Connecticut v. Massachusetts** *(supra)*.

Having thus answered the New Jersey exceptions to the salient law point of the Report by the Special Master and having also disposed of two closely correlated propositions of law, let us now turn to those major issues of fact raised by Pennsylvania's intervention and assailed by the New Jersey and New York exceptions.

C. The Special Master committed no error in adopting and applying the Pennsylvania plan of impounding and release to the New York diversion.

The doctrine of fair and equitable apportionment requires that no substantial damage shall result from the division and reasonable use of interstate waters. If, therefore, the waters of the Delaware River are to be fairly and equitably apportioned between the three States, it was essential that a plan of impounding and release be devised which would permit of such an apportionment without substantial damage to any interest. After an exhaustive study of the entire question of damages, the Pennsylvania engineers formulated a plan for the impounding and release of water that allows all three States to take their fair and equitable shares in the waters of the Delaware River and its tributaries without causing material damage to any interest and at the same time effects the maximum conservation and utilization of said interstate waters.

One of the chief virtues of the Pennsylvania plan of impounding and release is that it not only better protects all downstream interests against damage from the present New York taking but also precludes the possibility of any substantial damage arising under an apportionment of the waters of the Delaware River between the three States. Moreover, the Pennsylvania proofs disclose that its plan of impounding and release becomes increasingly superior as each State claims its fair and equitable

share in said interstate waters and is the only plan presented to the Special Master that permits a complete apportionment between the three States without substantial damage.

The Special Master adopted the principle of the Pennsylvania plan of impounding and release and applied it to the extent that New York is allowed to take water from its tributaries of the upper Delaware River (R. 4951). Both New Jersey and New York take exception to this finding and urge that their respective plans of impounding and release be adopted and applied by this Court.

In order to demonstrate the superiority of the Pennsylvania plan of impounding and release, we shall first discuss in detail its terms and conditions and then compare it with the New York and New Jersey plans for the impounding and release of water. The comparison of the three plans under this section of the Pennsylvania brief will consist almost entirely of (1) a summary of sundry water statistics and their relation to stream flow and (2) an exposition of conflicting theories regarding the functions of compensation water and the criteria of river regulation. The respective effects of the three plans upon the various downstream interests will be discussed at length in the next main section of this brief, which will deal with the alleged elements of damage.

As a preface to our discussion of the relative merits of the three plans, we desire to point out to this Court that the Pennsylvania proofs contemplated a present taking of 600 m.g.d. from the New York

tributaries of the upper Delaware River and a future total taking of 1750 m.g.d. by all three States from their respective tributaries by the year 1980. The Special Master in approving and applying the principle of the Pennsylvania plan of impounding and release limited it to a present taking of 440 m.g.d. by New York City (R. 4951).

This cutting down of New York's proportionate share in the waters of the Delaware River does not in any manner preclude or militate against the unqualified adoption by this Court of the principle underlying the Pennsylvania plan of impounding and release. On the contrary, it only emphasizes the flexibility of the Pennsylvania plan and corroborates what the Pennsylvania engineers repeatedly stated, namely, that their plan was designed to meet every condition of taking, whether large or small.

1. *The Pennsylvania plan.*

Because the New Jersey and New York briefs do not set forth in any detail the Pennsylvania plan of impounding and release but assume that this Court is familiar with it, we shall first state and explain its terms and conditions and then show what effect it will have upon stream flow in the Delaware River. This, we believe, will facilitate our discussion of its superior merit under all conditions of taking.

The Pennsylvania plan was presented in evidence by Mr. Charles E. Ryder, Chief Engineer and Secretary of the Pennsylvania Water and Power Resources Board, and is divided into two parts, the first govern-

ing diversions from tributaries of the Delaware River above Port Jervis, New York, and the second governing diversions from tributaries between Port Jervis and Trenton, New Jersey (R. 3446-48, 3466). It provides as follows (R. 3466-67):

> "In that part of the Delaware River above Port Jervis, water may be impounded on tributaries for diversion whenever the flow of the Delaware River at both Port Jervis and Trenton exceeds 0.5 c.s.m. Whenever the flow at Port Jervis or Trenton falls below 0.5 c.s.m., then so much water shall be released from the impounding reservoirs as will maintain this flow at 0.5 c.s.m., provided that the required rate of such release shall not exceed 30 per cent. of the average run-off rate for the period of record on the controlled area from which the release is made" (R. 3466-67).
>
> "In that part of the Delaware drainage basin tributary to the Delaware River between Port Jervis and Trenton, water may be impounded on tributaries for diversion whenever the flow of the Delaware River at Trenton exceeds 0.5 c.s.m. Whenever the flow at Trenton falls below 0.5 c.s.m., then so much water shall be released from the impounding reservoirs as will maintain this flow at 0.5 c.s.m., provided that the required rate of such release shall not exceed 30 per cent. of the average run-off rate for the period of record on the controlled area from which the release is made" (R. 3466-67).

At Port Jervis, a river stage of 0.5 c.s.m. represents a flow of 1535 c.f.s. or a gage reading of

approximately 2.3 (R. 3469, 3472). At Trenton, a river stage of 0.5 c.s.m. reads 0.6 on the gage and equals a flow of 3400 c.f.s. (R. 3469, 3472). These figures of translation are taken from the rating curve (Ex. 17) prepared by New Jersey (R. 3472-73).

The 0.5 c.s.m. stage control and the 30 per cent. rate of release under the Pennsylvania plan are not arbitrary determinations by the Pennsylvania engineers (R. 3534-35). After the most complete and careful study, they concluded that this combination afforded and assured the best control and regulation of the Delaware River (R. 3468-69, 3534-35, 3538, 3609-10, 3664-65, 3708).

Mr. Ryder declared that before adopting the figure of 0.5 c.s.m. as the stage control the Pennsylvania engineers studied and used other c.s.m. figures in order to fix the point at which releases will do the most good to the river by bringing up the low stages (R. 3468, 3534-35). That figure was selected because it makes possible the development of the Pennsylvania tributaries and at the same time affords the best regulation of the river (R. 3538).

Mr. Arthur E. Morgan, a civil engineer specializing in water and flood control and reclamation work and with extensive practical experience along these lines (R. 3181-86), in the course of his testimony as an expert called on behalf of Pennsylvania, asserted that a higher point of control than 0.5 c.s.m. will unduly restrict the possibilities of storage and a lower point of control will unduly affect the conditions of the river (R. 3664-65). A stage control of 0.5 c.s.m.

seems to be about the point where one gets the diminishing returns from either direction; that is, where a large amount of storage is not especially necessary, and above which a greater flow of the river is not particularly necessary (R. 3664-65). It seems to be the point where the two values most nearly balance (R. 3665).

The selection of the 0.5 c.s.m. stage control is not a limit upon the flow in the Delaware River but is merely a point of control at which the natural flow of the Delaware River is to be augmented under the Pennsylvania plan by the release of compensation water from the impounding reservoirs (R. 3609-10).

New Jersey unsuccessfuly attempted to show by cross-examination of Mr. Ryder that a stage control of 1 c.s.m. would produce better results; but the only result of this attempt was to bring out the fact that this higher stage control would prevent Pennsylvania and New Jersey from ever obtaining a water supply from their tributaries of the Delaware River (R. 3537).

Regarding the selection of the 30 per cent. rate of release, Mr. Ryder stated that the storage possibilities in Pennsylvania do not appear to be equal to those in either New York or New Jersey (R. 3468-69); and therefore computations were made by the Pennsylvania engineers to show the relative storage requirements for various rates of release (R. 3469). This investigation disclosed that the amount of release should bear some relation to the amount of run-off from the controlled area, and that due to the limited

storage possibilities on the Pennsylvania tributaries of the upper Delaware River, a rate of release higher than 30 per cent. of the average rate of yield will not be practicable with the 0.5 c.s.m. stage control (R. 3469).

The 30 per cent. rate of release prescribed by the Pennsylvania plan relates to the average rate of yield of the catchment area over a period of years and not to the average annual yield or run-off (R. 3511). However, this rate of yield is not final; but is open to correction or modification by future flow records and data of the catchment area (R. 3482, 3571, 3665-66).

The combination of an 0.5 c.s.m. stage control and a 30 per cent. rate of release will according to Mr. Ryder provide the most economical and the most desirable control and regulation of the Delaware River (R. 3468). With the same average yearly amount of water to be released from storage, it would, of course, have been possible to use a lower c.s.m. rate at Port Jervis and Trenton and a correspondingly higher percentage of the yield for the rate of release, or *vice versa* (R. 3468). It was therefore a question of first weighing different methods as to the time and the amount of releases and then determining what would give the best regulation of the river (R. 3535-36).

The naming of two points of control under the Pennsylvania plan is also in no sense an arbitrary determination but is ascribable solely to the desire of the Pennsylvania engineers to provide the best

method of river control and regulation (R. 3613-14, 3674-75).

Mr. Ryder testified that Port Jervis and Trenton were selected as points of control because the fundamental purpose of releases under the Pennsylvania plan is to increase the flow in the channel of the Delaware River, whenever it is low; and if releases are based on stage control at Port Jervis and Trenton, the effect is to afford a better regulation in the flow of the river than if only one point is used (R. 3483-84, 3613-14).

Since any taking of water will affect the whole length of the river and is not merely confined to the catchment area from which water is taken, releases should be based on such points of control as can best regulate and protect the river not only at the point of taking but also throughout the entire length affected by that taking (R. 3614).

Mr. Morgan likewise explained that the reason behind two points of control under the Pennsylvania plan is that the Commonwealth of Pennsylvania is primarily interested in the regimen of the Delaware River from Port Jervis, New York, down to Trenton, New Jersey (R. 3675); and because that section of the river is throughout its length affected by the New York diversion taking water out of the watershed, the Pennsylvania engineers believed that there was a responsibility on the part of New York to protect it (R. 3675, 3688).

A stage control point at Trenton alone will be generally satisfactory; but there are times when a flood

or high water will come down the Lehigh River and so raise the Trenton river stage that no release of water is necessary under that point of control (R. 3674-75). If at the same time, the Delaware River is dry or low at Port Jervis, no release of water will be made to meet that need, because the river is high at Trenton (R. 3675).

If Port Jervis alone is taken as the point of control, the converse situation may result (R. 3675). That sole point of control will take care of the regimen immediately below Port Jervis but will not protect the river at or near Trenton, when its stage is depleted by low water in the Lehigh River (R. 3675).

With a stage control at both Port Jervis and Trenton, if the Delaware River falls below the prescribed stage at either place, releases will be made to bring up the stage to the required amount (R. 3675). In actual fact, it will be only possibly three or four times a year and for short periods and for small amounts that these two stations will differ (R. 3675); but having a control at the two stations will insure a more satisfactory regimen of the river (R. 3675).

Both Mr. Ryder and Mr. Morgan believe, however, that the Pennsylvania plan can be operated from either point of control, if necessary, when New York alone is taking water; but a single point of control will be less efficient and hence inadvisable (R. 3484, 3675). The Special Master recognized that New Jersey and Pennsylvania are interested primarily in the condition of the Delaware River between Port

Jervis and Trenton and accordingly adopted the two points of control so that the regimen of the river between these points could be better preserved (R. 4819-20).

Having thus explained why the Pennsylvania engineers selected (*a*) a stage control of 0.5 c.s.m., (*b*) a 30% rate of release, and (*c*) two points of control, let us now consider the effect of the Pennsylvania plan of impounding and release upon stream flow in the Delaware River. In order to illustrate graphically that effect, two sets of daily flow diagrams with supporting data were prepared and offered in evidence by the Commonwealth of Pennsylvania. One set of flow diagrams and supporting data (Exs. 417-22) depicts the daily effect upon stream flow at Port Jervis for the five typical years of 1909, 1919, 1922, 1928 and 1929, when New York alone is taking 600 m.g.d. under the Pennsylvania plan (R. 3507-14).

The other set of flow diagrams and supporting data (Exs. 413-16) graphically illustrates the daily effect upon stream flow at Trenton for the years 1907-1929, both inclusive, when New Jersey, New York and Pennsylvania are taking a total of 1750 m.g.d. under the Pennsylvania plan (R. 3488-3507). The reason underlying the preparation and submission in evidence by Pennsylvania of this second set of flow diagrams and supporting data was the belief of the Pennsylvania engineers that within the next fifty years all three States would be taking that amount of water from the tributaries of the upper Delaware

River; and they therefore desired to demonstrate the superiority of the Pennsylvania plan under all conditions of taking.

The Pennsylvania flow diagrams are similar to the New York flow diagrams (Exs. 325, 334) which set forth the effect of the New York plan (Ex. 4) upon stream flow at Port Jervis, Riegelsville and Trenton during the same period of years, and were jointly prepared by the New York and Pennsylvania engineers (R. 3450). In this regard, it should be noted that New Jersey admits that the New York and Pennsylvania flow data are in substantial agreement with the New Jersey computations so that either set of figures may be used for the purposes of this case (R. 4086-87, 4390-98).

These flow diagrams and supporting data bring out the following salient features of the Pennsylvania plan of impounding and release, namely: that low flows in the Delaware River are substantially increased throughout the entire year, such increases frequently amounting to 100 per cent.; that no water is taken or impounded when stream flow falls below the 0.5 c.s.m. stage control; that there is a greater uniformity of flow as well as a closer approximation to uniform regulation at low levels; that by providing for greater storage of water during high flows, it is possible to release a larger quantity of compensation water to augment low flows, when there is a deficiency, thus effecting a greater saving of water; that during wet years surplus water is stored in order to cut down the takings and increase the

releases during subsequent dry years; and that there is no release of compensation water on the top of floods or high flows when not needed (R. 3488-3503, 3507-14, 3680-86).

New Jersey pointed out from these flow diagrams the unquestioned fact that the Pennsylvania plan greatly increases the number of days during which the flow in the Delaware River will be at a stage of 0.5 c.s.m. and sought to stress this fact as a valid objection to the plan (R. 3572-73, 3576-78). This prolongation of flows at 0.5 c.s.m. is attributable to two causes.

In the first place, the Pennsylvania plan calls for a greater storage of surplus flows in order to provide more compensation water; and this frequently results in cutting down these surplus flows to the stage control of 0.5 c.s.m. In the second place, the Pennsylvania plan by providing for a greater release of compensation water repeatedly brings up low flows to a river stage of 0.5 c.s.m. (R. 3488-3503, 3507-14, 3680-86).

This extension of the period during which the flow of the Delaware River will be at a stage of 0.5 c.s.m. does not constitute a valid objection to the Pennsylvania plan. It is uncontradicted that the critical period is that of low flows during warm weather. Under the Pennsylvania plan these low flows are so increased as to establish a uniform flow of 0.5 c.s.m. for substantial periods of time.

Mr. Morgan interpreted this prolongation of a uniform stream flow of 0.5 c.s.m. as convincing proof

that the Pennsylvania plan accomplishes the main purpose of regulation, which is to transfer surplus flows, which are of no special value when they occur, so that they may be used at times when they are of most value (R. 3687-88). The more surplus flows are thus saved for use in times of deficiency, the better is the regulation with its resultant improvement of river conditions (R. 3687-88). The manifold sanitary advantages from a uniformly regulated stream flow will be later described by Mr. Robert Spurr Weston, Sanitary Expert for the Commonwealth of Pennsylvania (pp. 76-77, 78-79, *infra*).

In preparing their daily flow diagrams, the Pennsylvania engineers arbitrarily assumed that at all stages of the river it will take one day for compensation water from the impounding reservoirs to reach Port Jervis, New York, and four days to reach Trenton, New Jersey (R. 3515-22). Mr. Ryder stated that inasmuch as time of transit varies with river stage, the engineers selected for the daily flow diagrams the actual time of transit for a Delaware River stage of 0.5 c.s.m., which is the stage control for releases under the Pennsylvania plan (R. 3515, 3520-21). All engineers agree that it was not practical to compute the actual time of transit for every river stage and then transpose it to the daily flow diagrams (R. 3497-98, 3521-22, 3965-66).

However, studies were made by the Pennsylvania engineers to determine the time of travel at various river stages; and these studies were tabulated and plotted in Exhibit 423 (R. 3515-19). These studies are

based primarily upon following downstream peaks or rises in stream flow as plotted, and recorded by the automatic charts at the Port Jervis, Belvidere, Riegelsville and Trenton gaging stations (R. 3515-16). The results of these Pennsylvania studies were checked by carefully following the crest of the Wallenpaupack wave in its course down the Delaware River during low stages in the summer of 1929 and the spring and summer of 1930 (R. 3516).

The Wallenpaupack wave is caused by the release of water intermittently each day by a power project on the Lackawaxen River, a Pennsylvania tributary of the upper Delaware River; and this wave affords an accurate yardstick for measuring the time of transit for releases under the Pennsylvania plan because its wave action, as well as the quantity of water so released are, to all intents and purposes, similar to the maximum compensation water that will be released from the New York catchment area under the Pennsylvania plan (R. 3516, 3526-27, 3600-01, 3688-89, 3690-91, 3723-24).

The Pennsylvania studies of time of transit were also checked against like computations made by the United States Army Engineers regarding time of flow in the Delaware River (R. 3522, 3611, 3723-24). This comparison revealed that the Pennsylvania figures for time of transit practically agreed with those of the Army engineers (R. 3522, 3581-82, 3611, 3723-24).

Mr. Ryder also compared the Pennsylvania figures for time of transit with the New Jersey computations,

which are based upon the method of using oranges as floats; and found that the Pennsylvania figures are considerably less (R. 3519-20). This difference is well illustrated by the time of travel for an 0.5 c.s.m. stage between Port Jervis and Trenton—the Pennsylvania figures are 69½ hours, whereas the New Jersey computations indicate 135 hours (R. 3519-20).

Although the New Jersey hydraulic engineers attacked the Pennsylvania computations of time of transit as too low (R. 3960-66, 3980, 4080-90), the Special Master adopted the computations of the Pennsylvania engineers as the more accurate and observed that oranges, used as floats by New Jersey, would obviously encounter many obstacles in a stream filled with rocks and shallows such as the Delaware and would be subjected to great delays in transit than would a wave of water (R. 4823-25). He pointed out that the definite ascertainment of the time of transit required for compensation water released from the impounding reservoirs is a very important fact; and therefore left the final determination of the time of transit at various stages of flow to the test of actual practice and experience (R. 4956).

Insofar as the Pennsylvania plan of impounding and release is concerned, the great importance of an accurate determination of time of transit lies in the fact that it will permit the accurate forecasting under that plan of the times when compensation water is to be released in order to increase low flows in the Delaware River. Accurate forecasting during

periods of transition, when the river stage is falling or rising, will effect a substantial saving of water, especially during the critical period of low flows in warm weather.

Mr. Ryder testified that accurate forecasting of such releases will be possible and practicable; and cited by way of example the long established practice of correctly predicting two or three days in advance the hour when a flood in the Susquehanna River following a heavy rain will reach points progressively downstream (R. 3529). This prediction covers not only the exact moment when the flood will reach certain points along the river, but also the actual river stage of the flood within two or three-tenths of a foot (R. 3529).

Mr. Morgan likewise declared that it is practicable and feasible under the Pennsylvania plan to forecast stages of the Delaware River so as to prevent releases on top of freshets such as are shown under the New York flow diagrams (R. 3677). He is personally acquainted with forecasting on the Mississippi River and other water systems as well as with the degree and accuracy to which forecasting can be carried (R. 3677-78); and believes that by correlating rainfall reports and stream flow records it is possible to forecast stages on large watersheds within very close limits (R. 3677-78). He recalls one instance when accurate forecasting permitted the movement of a very cumbersome piece of excavating equipment under a bridge across a very flashy stream, where the available clearance was a matter of inches (R. 3677-78).

After briefly reviewing the foregoing Pennsylvania proofs, the Special Master was of the opinion that the theory and reasons advanced by Messrs. Ryder and Morgan in favor of the Pennsylvania plan of impounding and release are sound (R. 4819-20). He was also of the opinion that their reasons in favor of the Pennsylvania plan as being preferable to the New York plan of releasing water are equally sound (R. 4819-20).

2. *Its superiority over the New York plan.*

After stating the New York plan of impounding and release, we shall set forth under this heading of our brief (*a*) the several reasons for its modification by the Pennsylvania engineers, (*b*) the chief differences between the New York and Pennsylvania plans of impounding and release, (*c*) a comparison of the storage requirements and the amount of compensation water released under the two plans, and (*d*) the many advantages of the Pennsylvania plan over the New York plan.

Mr. Merriman, an expert witness called on behalf of New York City, stated that under the New York plan of impounding and release compensation water will be released from the impounding reservoirs at the rate of 0.45 c.s.m. during the four months of July, August, September and October of each year regardless of the natural flow of the catchment area; and that a like amount of compensation water will be released at any other time during each year when the

natural flow of the catchment area is less than 0.45 c.s.m. (R. 2537-44, 2718-19; Ex. 4).

There are many reasons why the Pennsylvania engineers believed it necessary to modify the New York plan of impounding and release. First among them is the fact that under the New York plan diversions by all three States will reduce the flow in the Delaware River during certain periods of low flows to such an extent as to be objectionable from the point of view of navigation and sanitation, with the possible result that Philadelphia and Eastern Pennsylvania may be precluded from taking 750 m.g.d. for water supply purposes (R. 3463).

A second reason is the sound principle of river regulation that the rate of release should be proportional to the average yield of the streams in the area to be developed rather than an arbitrary and inflexible 0.45 c.s.m. rate for all areas (R. 3463).

A third reason is that an arbitrary and inflexible rate of release of 0.45 c.s.m. will unfairly and improperly penalize the development of the New Jersey and Pennsylvania catchment areas, which have a far lower yield than the New York area (R. 3463-64).

A fourth reason is that the arbitrary and inflexible rate of release of 0.45 c.s.m. will increase waste on areas of high yield (*i. e.,* New York) and unduly increase the physical difficulties of development in areas of low yield (*i. e.,* New Jersey and Pennsylvania) (R. 3464).

A fifth reason is that compensation water can be used to greater advantage in regulating the flow in

the Delaware River by distributing it over different periods or in a different manner, so that it will not be wasted by arbitrary and inflexible releases during periods of actual high flow, but will be strictly confined to periods of low flow only (R. 3464-65).

A sixth and final reason is that the release of compensation water should not be governed by conditions of stream flow at the impounding reservoirs but should be based upon downstream flow at one or more points to the end that low flows in the main channel may be substantially increased (R. 3464-65).

Mr. Ryder testified that the chief difference in the effect of the New York and Pennsylvania plans upon the flow of the Delaware River is that the Pennsylvania plan gives a proportionately larger increase in the flow during low stages or below 0.5 c.s.m. (R. 3485). To accomplish this result, the Pennsylvania plan proportionately reduces the flow during certain times of the year when that flow exceeds 0.5 c.s.m. (R. 3485).

Mr. Morgan declared that the most striking differences between the New York and Pennsylvania plans are (*a*) that the releases and takings under the New York plan are determined by conditions in New York State on the reservoir areas, whereas under the Pennsylvania plan they are determined by conditions down the river with the result that compensation water satisfies the needs of the lower river and is not wastefully released on top of high flows; (*b*) that under the New York plan there are arbitrary releases during the four summer months, whereas under the Pennsylvania plan no release is

made unless the river below needs it and in that way there can be a greater saving of abundant water through storage for release when needed; (*c*) that the New York plan lets down either the total amount of release or none at all, whereas there are times when a partial release is desirable, and the Pennsylvania plan allows partial releases in proportion to the need so as to take care of any deficiency or diminution in flow; and (*d*) that the Pennsylvania plan will not only be very much simpler to operate than the New York plan but will also be easier to check up and determine whether it is being strictly followed (R. 3667-71).

Mr. Morgan concluded his comparison of the two plans by stating that the Pennsylvania plan saves water when water is available and releases it when it is needed to a greater degree than the New York plan (R. 3670). By arbitrarily releasing water when it is not needed, the New York plan thereby loses water that could be used for compensation (R. 3670). As the use of Delaware River water increases, the advantage of the Pennsylvania plan become more and more obvious and marked; and the arbitrariness of the New York plan becomes increasingly a disadvantage (R. 3670-71).

An excellent way of further determining the relative merits of the two plans is to compare their respective storage requirements and also the amount of compensation water released under each plan. The capacity of the storage reservoirs under the New York plan (Ex. 4) is computed by Mr. Merri-

man at 205 billion gallons (R. 2778-79). The Pennsylvania engineers estimate that the Pennsylvania plan will increase the New York storage requirements by 16 billion gallons or 8 per cent., thus involving an additional cost of $2,700,000 (R. 3615, 3691-92, 3725-26). This Pennsylvania estimate uses the same factor of safety as the New York engineers used (R. 3691-92). This factor is based upon the driest period of record and is closer to 50 per cent. than to 25 per cent., as alleged by Mr. Merriman (R. 3691-92).

A comparison of the compensation water to be released under the two plans will be stated first in terms of gallons and then in percentages.

Under the New York plan the average yearly amount of water released from the New York reservoirs for the period from 1907 to 1929 will amount to 25,380 million gallons (R. 3470, 3537). This yearly amount will fluctuate, the greatest total release in any one year being 34 billion gallons for the year 1914 and the smallest amount of release being about 22 billion gallons for the years 1907 and 1927 (R. 3469-70).

Under the Pennsylvania plan the average yearly amount of water released for the same period is 27,670 million gallons or 2,290 million gallons in excess of the average yearly releases under the New York plan (R. 3470, 3537). There is also a greater fluctuation in the yearly amounts of water released under the Pennsylvania plan, the maximum release being 47 billion gallons in 1918, and the minimum release being 6 billion gallons in 1922 (R. 3470).

These figures disclose a 9 per cent. increase in compensation water under the Pennsylvania plan when New York alone is taking (R. 3470). This is attributable to the Pennsylvania principle of impounding more water during times of high flow so that a larger amount of compensation water can be released during times of low flow to the greater advantage of all interests in the Delaware River waters (R. 3470-71). The New Jersey witness, Mr. Wollman, admitted that this principle of releases coincides with the true theory of compensation, viz.: that releases should be made only in accordance with needs (R. 4245-46).

If compensation waters are stated in percentages and not in quantities, then under the New York plan 69 per cent. of the yield of the New York catchment area will be diverted for water supply, 8 per cent. will be released as compensation water, and 23 per cent. will pass over the spillways (R. 3470, 3601). Under the Pennsylvania plan 69 per cent. of the yield of the New York catchment area will be used for water supply purposes, 8.7 per cent. will be let down as compensation water, and the remaining 22 per cent. will constitute spillway water (R. 3470, 3571, 3601).

A comprehensive tabulation comparing the amount of compensation water released under the two plans when all three States are taking water from the Delaware River and showing the comparative increase in stream flow at Trenton was read into the record of this case as part of the testimony of Mr. Morgan

(R. 3753-55). There is also a similar tabulation comparing the two plans, when New York alone was taking its 600 m.g.d. (R. 3755).

These tabulations show that although the total average release under the Pennsylvania plan will be 77.9 million gallons yearly, when all three States are taking, which average yearly release is a little less than the average yearly release of 79.5 million gallons under the New York plan, yet the increase in flow under the Pennsylvania plan will be 17.3 billion gallons, or a little more than twice as much as under the New York plan (R. 3743). Because it is better distributed, the increase in flow is thus more than twice as great during low periods under the Pennsylvania plan (R. 3743).

These tabulations likewise show that when New York alone is taking the Pennsylvania plan more than doubles the increase in flow that would result during low periods under the New York plan (R. 3743-44). Because of the same better arrangement, the increase in flow is always greater than under the Pennsylvania plan (R. 3744).

Mr. Morgan called attention to the fact that the releases from the Wallenpaupack power development will so increase the downstream river stages that the total releases under the Pennsylvania plan will be less than under the New York plan during any given year; and hence the storage requirements under the Pennsylvania plan will be correspondingly less (R. 3691-92). The Wallenpaupack releases are of most recent origin and therefore appear only in the

last two years of the Pennsylvania flow diagrams and computations.

The foregoing comparison of the two plans, as well as the daily flow diagrams and supporting data, completely justify the finding by the Special Master that the Pennsylvania plan is better than the New York plan and should therefore be applied to the present New York taking (R. 4955-57). The superiority of the Pennsylvania plan rests in the fact that (1) it effects a greater saving and conservation of water through several means without appreciably increasing the burden placed on impounding reservoirs, (2) it is far easier to operate and (3) it improves downstream river conditions to a greater extent.

As previously pointed out, the greater saving and conservation of water is accomplished by providing for a greater impounding of water at flows above 0.5 c.s.m. in order to permit a greater release of compensation water during the critical period of low flows under the 0.5 c.s.m. and by further providing that releases, whether total or partial, are to be made only when river conditions require them and only in proportion to those needs and the yield of the catchment area. Thus the Pennsylvania plan of impounding and release avoids the waste of compensation water that is inherent to the New York plan.

The simplicity of operation, which the Pennsylvania plan alone enjoys, is attributable to the elimination of the many variables incident to the measurement of stream flow under the New York plan and the

substitution of a direct and public determination of stream flow at gaging stations under the jurisdiction of the United States Geological Survey.

The greater improvement of downstream river conditions under the Pennsylvania plan of impounding and release will be further demonstrated under the subsequent section of this brief that treats with the various alleged elements of damage.

Obviously recognizing the fact that the Pennsylvania plan without greatly increasing the burden of impounding materially bettered river conditions during the critical periods of low flow, counsel for New York City interposed no serious objection to the adoption and application of the Pennsylvania plan in his argument and brief before the Special Master. Exceptions have since been filed by him to the Report because, *inter alia,* the Special Master applied the Pennsylvania plan of impounding and release to the 440 m.g.d. alloted to New York City. The basis for these exceptions is the alleged undue hardship of the Pennsylvania plan, when New York City is limited to the reduced quantity of 440 m.g.d.

This ground of complaint overlooks one of the basic principles of the Pennsylvania plan of impounding and release, namely, that the appropriator's duty to release compensation water is not arbitrary and inflexible as under the New York plan but is proportioned to the yield of the catchment area and is subject to the maximum limitation of 30% of the average rate of yield of the impounded area. The Pennsylvania plan, therefore, not only readily

adapts itself to any catchment area as well as to any taking of water, however large or small, but also prorates the burden of impounding and releasing compensation water to every taking. Had the Pennsylvania plan provided that New York City must guarantee a downstream river stage of at least 0.5 c.s.m., then its burden would indeed have been increased by the reduction of its quota of water to 440 m.g.d.; but, as previously explained, 0.5 c.s.m. is merely a point of control determining when the release of compensation water shall begin or cease.

New York City also complains of the lack of any assurance under the Report of the Special Master that Pennsylvania must contribute its share of compensation water when it takes water from the Pennsylvania tributaries of the upper Delaware River. The gravamen of this complaint is that New York City must build up stream flow in the Delaware River in order to protect against its depletion by unrestricted Pennsylvania takings. This alleged grievance likewise overlooks the undisputed fact that the Pennsylvania plan of impounding and release was formulated as a guiding rule for all takings of Delaware River water by all three States, and that the Commonwealth asked the Special Master to adopt it for all takings, present and future, but the Special Master considered the request premature insofar as Pennsylvania and New Jersey were concerned and hence limited the rule to the present New York taking (R. 4950-51).

Furthermore, any future taking of upper Delaware

River water by Pennsylvania will under the doctrine of equitable apportionment be conditioned so as to safeguard the interests of all three States. The Commonwealth has always insisted that any taking of upstream water must not be unrestricted and expects to carry its burden of compensation water whenever it goes to the Pennsylvania tributaries of the upper Delaware River for a future source of water supply and thus affects the natural flow of the river below the impounded area. That burden is a necessary predicate of its declared policy of conservation and maximum utilization of the waters of the Delaware River through impounding high flows in order to build up low flows by the release of compensation water.

It is indeed astounding to have New York City point to the Wallenpaupack power project as illustrative of Pennsylvania's failure to carry its burden of improving downstream river conditions, since it is an uncontradicted fact that the impounded waters released intermittently by the daily operation of the power plant so augments flows below 0.5 c.s.m. in the lower river as to decrease substantially the amount of compensation water required to be released by New York City under the Pennsylvania plan of impounding and release. Besides, the Wallenpaupack power project diverts no water from the Delaware River watershed, whereas New York City is permanently diverting 440 m.g.d. and the fair and just price exacted for the privilege of such permanent diversion is the release of compensation water to augment the natural flow during the critical period of low flows.

We submit that the Pennsylvania proofs convincingly demonstrate the superiority of the Pennsylvania plan of impounding and release under all conditions of taking; that the Special Master was fully justified by the evidence in requiring New York City and State to impound and release water pursuant to the principle of the Pennsylvania plan, despite any reduction in their allotment of water; and that there will be no undue burden upon New York City and State under the Pennsylvania plan because of the reduction of their present taking to 440 m.g.d.

The superiority of the Pennsylvania plan is further evidenced by the proofs upon damage, which will be fully set forth and discussed in the following main section of this brief (pp. 68-156, *infra*).

3. *The inchoate New Jersey plan.*

There are so many and such varying statements of the so-called New Jersey plan for the impounding and release of Delaware River water that it is difficult, if not impossible, to state precisely its terms and conditions. Confessedly, it is an eleventh hour improvisation in an alleged attempt to mitigate damages from the New York diversion, and the details thereof have never been worked out by the New Jersey engineers (R. 4063). Besides, no supporting flow diagrams or other data were ever submitted by New Jersey to show the effect of their plan upon stream flow and river conditions, although their engineers found ample time to work up cost sheets for the two New York reservoirs required under their plan.

It is thus impossible to discuss the inchoate New Jersey plan with the same precision and detail that have marked our discussion and comparison of the Pennsylvania and New York plans of impounding and release. The New Jersey witnesses are in agreement upon only one term and condition of their plan, namely, that the appropriator may take as much water as he desires, provided always that he impound two gallons of water for every gallon that he proposes to divert and that he release one gallon of water for every gallon diverted.

The New Jersey engineers do not and cannot agree upon the manner in which the non-diverted one-half of impounded water is to be released as compensation water. Professor Barrows and Mr. Sherman prefer a continuous release each day of a substantial quantity of compensation water and the surplus or excess storage to be released for flushing the river and other purposes as needed (R. 4024-29, 4055-59, 4063, 4085-93, 4105-13). Mr. Horton suggests that the said one-half be not constantly released but be let down in varying quantities depending upon stream flow at Port Jervis (R. 4443-47, 4483-85).

No New Jersey witness has ever ventured to suggest who will determine when, in what quantities, and for what purposes the impounded water is to be released or what principle and rule shall govern said releases. And the New Jersey brief likewise talks freely of emergency let-downs as well as the release of compensation water without attempting to prescribe any regimen or rule other than that of vague and

undefined river needs as the controlling factor. Such irresponsible mouthings cannot take the place of a well defined rule or plan such as the Pennsylvania plan of impounding and release.

Counsel for New Jersey in their brief confuse the conflicting statements of their witnesses regarding a regulated flow of 1 c.s.m. and speak of their plan as if it provided a minimum regulated flow of 1 c.s.m. at Trenton or 6800 c.f.s. In this regard they cite the Pennsylvania engineers, Messrs. Ryder and Weston, as approving of a regulated flow of 1 c.s.m. at Trenton.

Neither claim for their embryonic plan is justified. When Professor Barrows speaks of a regulated flow of 1 c.s.m., he refers to such a flow from the upstream catchment area (R. 4055-56). To insure a constant uniform flow of 1 c.s.m. at Trenton, would require a catchment area many times greater than the 928 square miles that he proposes for the New York catchment area in order that a regulated flow of 1 c.s.m. can be provided at the impounding reservoirs (R. 4055-56).

Messrs. Sherman and Horton use the term 1 c.s.m. as a downstream stage control governing releases but in no wise assuring a regulated flow of 6800 c.f.s. at Trenton (R. 4089, 4108, 4483-85). Both of these engineers, like Professor Barrows, contemplate a New York catchment area of approximately 928 square miles with a yield slightly in excess of 2 c.s.m., of which 1 c.s.m. or 600 m.g.d. is to be diverted for New York water supply purposes and the remaining

1 c.s.m. is to be used for compensation water (R. 4089, 4108, 4483-85).

Not only Messrs. Ryder and Weston, but also General Pillsbury testified without contradiction that the costly burden of maintaining a regulated flow of 1 c.s.m. at Trenton was not only impracticable but also far exceeded any benefit that would obtain from such a regulation (R. 3537, 3654-55, 3923-24). The impracticability as well as the infeasibility of a regulated flow of 1 c.s.m. at Trenton becomes at once apparent, if due regard be had for the undisputed fact that the Delaware River is a flashy stream, that is, it is subject to wide variations in flow throughout its course. According to the records of the United States Geological Survey (Ex. 15) the flow in the Delaware River at Port Jervis has varied from 92,700 c.f.s. to 175 c.f.s., and at Trenton the flow has varied from 160,000 c.f.s. to 1240 c.f.s. This Court will doubtless recall that in the case of **Wyoming v. Colorado** (*supra*), it had occasion to discuss at page 476 of the opinion the infeasibility of equalizing the flow in a western stream showing the same flashy tendency.

The objections, so far as Pennsylvania is concerned, to the inchoate New Jersey plan are many. The first fatal objection is that it will inevitably preclude Philadelphia and Eastern Pennsylvania from obtaining their fair and equitable share in the waters of the upper Delaware River.

Mr. Swaab, a consulting engineer possessing special knowledge of the water resources and systems of Philadelphia and Eastern Pennsylvania through his

membership on various Water Commission, and his construction of Philadelphia's present system of water supply (R. 3371-77), testified in rebuttal of the New Jersey plan that because of inferior storage possibilities it would be utterly impossible for Philadelphia and Eastern Pennsylvania to secure from the Pennsylvania tributaries of the upper Delaware River the 750 m.g.d. which Philadelphia and Eastern Pennsylvania will require by the year 1980 and at the same time to release from that water supply area 750 m.g.d. in accordance with the New Jersey plan (R. 4518-19).

Because the New Jersey engineers had made no study of storage possibilities in Pennsylvania (R. 4055, 4105-08) counsel for New Jersey was in no position to contradict this testimony of Mr. Swaab except through cross-examination (R. 4518-19). When this testimony remained unshaken upon cross-examination, counsel for New Jersey was forced to take the arbitrary and unwarranted position that Philadelphia and Eastern Pennsylvania will have to content themselves with whatever lesser amount of water can be obtained from these sources under the New Jersey plan (R. 4518-22).

In this regard it should be further noted that the New Jersey plan will also prevent the metropolitan area of North Jersey from procuring from the New Jersey tributaries of the Delaware River the 400 m.g.d. that will be required for water supply purposed by the year 1980. It is uncontradicted that 400 m.g.d. is the maximum development from this

area (R. 3062-65, 3603-05, 3625-28); and that in order to get that amount it will be necessary to take 80 per cent. of the yield or run-off of the catchment area (R. 3546-47). North Jersey, like Pennsylvania, must therefore be satisfied with a water supply insufficient to meet its reasonable future needs.

A second conclusive objection to the New Jersey plan is that it necessarily involves an even greater waste of compensation water than under the New York plan. It contemplates the same arbitrary and inflexible release of water regardless of river conditions. Such arbitrary and inflexible releases are not confined to the four dry months, as under the New York plan, but will continue during the whole year. In addition, the daily amount of compensation water to be frequently wasted under the New Jersey plan is at least 787 c.f.s. which is substantially greater than the 275 c.f.s. release of compensation water under the New York plan.

Counsel for New Jersey complain in their brief that the Pennsylvania plan of impounding and release will take away the beneficial summer rises, but are entirely obvious of the fact that their plan with its 100% impounding of the catchment area will take all summer rises, whereas the 70% development of catchment area under the Pennsylvania plan will permit a substantial portion of said rises to flow downstream as surplus waters.

A third unanswerable objection to the New Jersey plan is the entire absence of any restriction whatever upon the quantity of water that may be diverted

from the Delaware River so long as one gallon is released for every gallon taken. Under the New Jersey plan, New York with its high yield of over 2 c.s.m., its large drainage area of 2389 square miles, and its admittedly superior storage possibilities, can readily take 2500 m.g.d. for water supply purposes if it requires that amount, regardless of the depletion of the river and injury to the rights and interests of Pennsylvania, whereas Pennsylvania and New Jersey will be precluded from taking their fair and equitable shares of Delaware River water. And yet, counsel for New Jersey claim for their plan the alleged virtue that it will bar New York from carrying out its purpose of taking 2500 m.g.d. eventually from the Delaware River, thus failing utterly to realize that their plan plays into New York's hand in that regard.

A fourth and final convincing objection to the New Jersey plan is that it calls for far more variables than either the Pennsylvania or the New York plan. It is a plan that permits any party along the stream to insist at will that compensation water be let down to promote his own interests. The New Jersey plan contains no suggestion as to what authority will determine when and in what amounts compensation water is to be let down to satisfy the peremptory demands of the varying and conflicting interests downstream; and that appalling deficiency or failure in their plan is glossed over in the New Jersey brief by loose statements regarding undetermined releases and indefinite river needs.

The Commonwealth of Pennsylvania submits that the New Jersey plan of impounding and release is not a sound plan and is contrary to every known principle of conservation. Not only is it highly wasteful and impracticable but it will necessarily prevent all three States from claiming their fair and equitable share in the waters of the upper Delaware River for water supply purposes. The only possible justification for the New Jersey plan is that it provides an indispensable feeder to the giant power project which New Jersey would like to impose upon New York and Pennsylvania as a price for obtaining a water supply from the Delaware River.

It is little wonder that the Special Master rejected the New Jersey plan because of the unnecessarily heavy burden that it imposed (R. 4957). In thus rejecting the New Jersey plan, he commented upon the fact that this plan came into the present case at a very late stage (only at the hearing of rebuttal evidence) and pointed out that its proponents confessedly had had no opportunity to go into any details (R. 4957-58). The Special Master therefore concluded that it was not worth his while to pursue the New Jersey plan further (R. 4957).

The Pennsylvania plan of impounding and release is manifestly so superior in every detail to the inchoate New Jersey plan that this Court should have no hesitation in accepting the recommendation by the Special Master that the principle of the Pennsylvania plan should be approved and applied to the present taking of 440 m.g.d. by New York City.

D. The Special Master committed no error in finding that no substantial damage will be suffered under the Pennsylvania plan of impounding and release.

As previously stated, the Pennsylvania engineers in formulating their plan of impounding and release fully realized that they must devise a rule that would protect downstream interests against damage not only under the present New York taking but also under any future taking by all three States. The Pennsylvania proof on damages were therefore directed to establishing not only the absence of present damage under their plan of impounding and release but also the absence of future damage under a complete apportionment of the interstate waters of the Delaware River.

In our discussion of damages and the findings of the Special Master in this regard, it is highly important that we fully review the Pennsylvania proofs on damages in order to show that under our plan of impounding and release there will be no substantial damage either when New York City and State are presently taking water from the New York tributaries of the upper Delaware River, or when Philadelphia and Eastern Pennsylvania are later claiming their fair and equitable share of water from the Pennsylvania tributaries of that river. The importance of these broad Pennsylvania proofs lies in the fact that a Pennsylvania upstream taking will, through its by-passing of water from the Pennsylvania tributaries upstream to a downstream centre of distribution in or

near Philadelphia, temporarily affect the same New Jersey interests as are alleged to be affected by the present New York taking, save and except recreation and the oyster industry. We shall later point out why these two interests will not be affected by a Pennsylvania taking, when we come to discuss these two alleged items of damage under their respective subheadings of this section of our brief.

Should we now leave unanswered the unwarranted New Jersey contention that material damages will result to their interests, even under the Pennsylvania plan of impounding and release, and should we also fail to cite the abundant Pennsylvania proofs that fully sustain the finding by the Special Master of slight and immaterial damage under our plan, Philadelphia and Eastern Pennsylvania would in all probability be confronted with an equally groundless New Jersey charge of substantial damage when they are ready to take in the future their fair and equitable share of water from the Pennsylvania tributaries of the upper Delaware River.

The Special Master found that the effect of the New York diversion (Ex. 4) will be slight and immaterial upon (*a*) sanitation, (*b*) municipal water supply, (*c*) industrial uses, (*d*) agriculture, and (*e*) fishing; but that its effect upon (*f*) recreation, and (*g*) the oyster industry, will be to cause somewhat more than slight damage (R. 4965-66). He further found that totalling all the effects of the New York diversion (Ex. 4) indicates a substantial damage to New Jersey and its citizens, which damage is greater

than New Jersey should be required to bear or yield to other States in the enjoyment of a common stream (R. 4966).

The Special Master also found that any substantial damage to New Jersey and its citizens can be removed (1) by reducing the New York diversion to 440 m.g.d., (2) by adopting and applying the principle of the Pennsylvania plan of impounding and release, and (3) by treatment of sewage and industrial waste at Port Jervis (R. 4966-67).

The principal protection sought by the Pennsylvania engineers for the rights and interests of Philadelphia and Eastern Pennsylvania in the waters of the Delaware River and its tributaries was the adoption and application by this Court of their plan of impounding and release to any taking of said waters. That protection was sought by the Commonwealth in order that all downstream interests might be presently as well as in the future protected against material damage from any taking of Delaware River water and also in order that all obstacles might once and for all be thus removed to a fair and equitable apportionment of the interstate waters of said river among the three States.

The Special Master partially granted that protection to the Commonwealth of Pennsylvania, when he upheld the superiority of the Pennsylvania plan of impounding and release and superimposed its principle upon the present New York taking in order to eliminate any substantial damage from the proposed New York diversion (Ex. 4). By so doing, he prac-

tically made certain the future adoption and application of that plan as the guiding principle when Philadelphia and Eastern Pennsylvania find it necessary to take water from the Pennsylvania tributaries of the upper Delaware River.

The superimposition by the Special Master of two other protective measures, for which the Commonwealth of Pennsylvania has not asked, namely, the cutting down of New York's share to 440 m.g.d. and the compulsory treatment of Port Jervis sewage and industrial waste, are obviously in furtherance of Pennsylvania's present rights and interests in the waters of the Delaware River and its tributaries.

The first measure will not adversely affect the future right of Pennsylvania to take its fair and equitable share in said waters, because the conditions and circumstances attendant upon any such Pennsylvania taking as well as the resultant effects thereof are necessarily so different from those surrounding and accompanying the present New York taking that any damage therefrom will be inconsequential and minimal.

The second measure is in accord with the sanitary program of all three States for the conservation of Delaware River water and should have an immediate beneficial effect upon Pennsylvania's rights and interests.

Consequently, the Commonwealth of Pennsylvania has filed no exceptions to the findings of the Special Master on damages. Because the New Jersey as well as the New York exceptions attack different findings,

we shall under each sub-heading of this section of our brief advert to the specific grounds of exception and by whom taken.

There is but one other preliminary matter to be brought out before entering upon a detailed analysis of the Pennsylvania proofs upon damages; and that is to repeat our prior statement that due to its flexibility and freedom from arbitrary rules, the Pennsylvania plan of impounding and release not only readily adapts itself to the reduced New York taking of 440 m.g.d. but will also show proportionally the same absence of material damage during high flows and the same improvement of river conditions during low flows that it reveals under the Pennsylvania evidence which is predicated upon takings of 600 m.g.d. and 1750 m.g.d.

1. *The sanitary condition of the Delaware River will not be seriously impaired.*

The Special Master found that the operation of the New York plan (Ex. 4) will impair to some extent, though not greatly, the sanitary condition of the Delaware River (R. 4880). He further found that this impairment can be eliminated by (1) requiring sewage treatment at Port Jervis, (2) reducing the New York diversion from 600 m.g.d. to 440 m.g.d., and (3) applying the Pennsylvania plan of impounding and release to the quantity of water which New York City is allowed to take (R. 4880).

New York City and State have alone excepted to this finding by the Special Master. Although the

State of New Jersey averred in its bill of complaint that the New York diversion would cause great and irreparable injury and offered extensive testimony in an effort to prove that the sanitary quality of the Delaware River would be seriously impaired by the New York taking, yet it has not seen fit to question in this Court the finding by the Special Master of only slight impairment to sanitary conditions in the Delaware River.

In reaching his opinion of slight impairment, the Special Master relied upon the uncontradicted fact that the critical period in the Delaware River, so far as sanitation is concerned, is that of low flows in warm weather; and that there is little or no danger from an insanitary condition during periods of high flow in cool weather (R. 4879-80). The Pennsylvania plan of impounding and release takes advantage of this basic sanitary fact and provides for the impounding of water, when sanitary conditions are favorable and the detriment from taking is slight, in order that compensation water may be released during the critical period of low flow with the resultant substantial improvement of unfavorable sanitary conditions.

The requirement by the Special Master that Port Jervis sewage must be treated is in accordance with the terms and conditions of the agreements between the three States for the sanitary conservation of the Delaware River that were offered in evidence by the Commonwealth of Pennsylvania (Exs. 425-26). The imposition of this condition upon the New York

taking should not constitute a serious financial burden; and should not in good conscience, we submit, be objected to by New York City and State.

Counsel, as well as the sanitary experts, have from the very beginning recognized the difference in conditions between the tidal and non-tidal sections of the Delaware River. Since the Pennsylvania testimony upon sanitation readily lends itself to such a differentiation, we shall first consider the upper Delaware River and then its tidal prism below Trenton.

No discussion of the sanitary conditions of this river can possibly be complete without a brief reference to the natural processes of self-purification that are responsible for its present sanitary condition and quality. As an introduction, therefore, to determining the effect, if any, of the Pennsylvania plan upon sanitation, we shall show not only existing sanitary conditions but also the capacity of the Delaware River to purify itself and to take care of any reasonable future increase in pollution over and above that now extant.

In proof of the present sanitary quality and condition of the upper Delaware River, the Commonwealth of Pennsylvania produced its 1929 State Sanitary Survey (Ex. 430). This field survey was made by Mr. Siebert, Executive Engineer of the Sanitary Water Board of the Pennsylvania Department of Health, in a year of average flow with an extraordinarily dry summer (R. 3822-34). It discloses that the average per cent. saturation of dissolved oxygen in the river is high and never declines below

80 per cent. at any point above the head of tide at Trenton; and that the bio-chemical oxygen demand is relatively low at all sampling stations and never equals or exceeds the dissolved oxygen content of the river (R. 3832-33, 3861-62). This favorable oxygen balance accounts for the excellent sanitary condition of the upper Delaware River (R. 3832-33, 3861-62).

The 1929 State Sanitary Survey was presented in tabular form as Exhibit 430 and in the form of a composite graph as Exhibit 431 (R. 3827-30). The results thus disclosed were then compared in a composite graph (Ex. 432) with the results of the New Jersey sanitary survey (Ex. 200). Such comparison disclosed that the two surveys are in remarkably close agreement; and that, although their average determinations of B. Coli vary somewhat, yet their average determinations for dissolved oxygen and bio-chemical oxygen demand, which are the criteria for determining sanitary conditions, are practically the same (R. 3854-55).

Mr. W. L. Stevenson, Chief Engineer of the Pennsylvania Department of Health, and Mr. Robert Spurr Weston, sanitary expert for Pennsylvania, agree with Mr. Siebert that the 1929 State Sanitary Survey establishes the present favorable sanitary quality and condition of the upper Delaware River, even during the critical period of relatively low stream flow and warm temperature (R. 3779, 3872). All three witnesses call attention to the further fact that this survey shows not only that natural purifi-

cation readily assimilates all pollution along the upper Delaware River within a short distance downstream but also that there is a present upstream capacity for self-purification that far exceeds existing pollution and is amply able to take care of any reasonable future increase in pollution (R. 3779, 3832-33, 3861-62, 3872).

In order to illustrate more forcibly the existing, enormous capacity for self-purification of the upper Delaware River, Mr. Weston prepared three exhibits (Exs. 435-37) indicating the "population-carrying capacity" of the stream, that is, its capacity to care for any additional future sewage and industrial waste when expressed in terms of population (R. 3869, 3876-81). These computations show that the actual population-carrying capacity of the river between Hancock, New York, and Trenton, New Jersey, averages 135,000 people, between Port Jervis, New York, and Trenton, New Jersey, 328,000 people, and between Easton, Pennsylvania, and Trenton, New Jersey, 2,052,000 people (R. 3878-79, 3938-42). They do not include and have no relation to the purifying work now being done by the upper Delaware River in taking care of existing pollution; but merely disclose, over and above the work now being done, how much additional pollution can in the future be safely taken care of by the present surplus oxygen balance (R. 3876-80, 3936-43).

These Pennsylvania proofs convincingly show the present sanitary quality and condition of the upper Delaware River, its enormous self-purifying capacity

and its unquestioned ability to take care of present and reasonable future pollution. The Pennsylvania sanitary engineers are therefore of the opinion that the upper Delaware River is now suitable for a source of public water supply, if treated and purified in the ordinary manner with chemicals and filtration (R. 3833, 3864-65). Its present B. Coli index is well within Dr. Streeter's standard of 50 B. Coli per c.c. and is from 500 to 1000 times less than the present B. Coli index at the Philadelphia water intakes on the Schuylkill and Delaware Rivers as testified to by Mr. Swaab (R. 3863-64).

When the results of the 1929 State Sanitary Survey (Exs. 429-31) were submitted to the Pennsylvania Sanitary Water Board, the Pennsylvania tributaries of the upper Delaware River were immediately classified as Class A streams, especially adapted for a water supply because of their cleanly condition and freedom from artificial pollution; and resolutions were consequently adopted by said Board relative to their sanitary conservation (R. 3775-80; Exs. 428-29).

Turning now to the present sanitary condition of the lower Delaware River, Mr. Weston testified that the present sanitary condition of the tidal prism below Trenton, New Jersey, varies greatly; and that conditions are critical at Philadelphia, Camden, and between Chester and the mouth of the Schuylkill River, especially during the warm months of the year (R. 3872). The 1929 records of dissolved oxygen at the Torresdale intake average approximately 60%

saturation for the three months of July, August and September (R. 3920-21).

The witness stated that these conditions will be greatly bettered and all nuisance avoided by the proper treatment of sewage and industrial waste (R. 3872). Such an improvement in the condition of the lower Delaware River is to be expected under Philadelphia's 1915 comprehensive plan (Ex. 427) for the treatment of sewage and industrial waste, which Mr. Stevenson described at length and which not only calls for a complete system of intercepting sewers and sewage disposal plants but also requires a minimum expenditure of $3,000,000. each year by the City for sewage disposal purposes (R. 3764-75, 3789-3815). That minimum sum has been regularly expended each year under this comprehensive plan; and eventually all of Philadelphia's sewage and industrial waste will be treated (R. 3764-75, 3789-3815).

Mr. Stevenson also described the present and proposed treatment of sewage and industrial waste by Pennsylvania cities along the Schuylkill and Delaware Rivers; and asserted that the agreements between New Jersey, New York and Pennsylvania for the sanitary conservation of the Delaware River (Exs. 425-26) had been faithfully lived up to with the result that the sanitary quality of the river had been accordingly improved (R. 3764-75). In the light of such proofs, it is deeply significant that no proof was offered by New Jersey regarding the treatment of sewage and industrial waste by Camden, Phillipsburg and other New Jersey municipalities along the

Delaware River in answer to Mr. Weston's criticism of New Jersey conditions, and in particular at Camden (R. 3872, 3905-06).

The best evidence of the unfavorable present sanitary condition of the lower Delaware River is afforded by the testimony of Mr. Swaab regarding the B. Coli index at the Torresdale intake. The five year average for that intake is 22,300 per 100 c.c. which is far beyond Mr. Streeter's standard of safety (R. 3433, 3864-65).

The population-carrying capacity of the lower Delaware River between Trenton, New Jersey, and Philadelphia, Pennsylvania, is shown by Exhibit 435 to be 404,000 people (R. 3878-79). Mr. Weston believes that this substantial decrease in capacity below Trenton may be accounted for by the increased time of transit (R. 3879). Due to the tide or its influence, Trenton water takes on the average 16.8 days to reach Philadelphia; while the time of transit from Easton to Trenton, with its population-carrying capacity of 2,052,000 people, is a matter of hours rather than days (R. 3879). More oxygen is therefore required to take care of pollution between Trenton and Philadelphia than to take care of the same amount of pollution in the same amount of water from Easton to Trenton (R. 3879-80).

Having thus shown present sanitary conditions in the upper and lower Delaware River, there remains but one other preliminary matter that should be discussed before taking up the main issue of what effect the proposed taking of water from the tributaries of the upper Delaware River will have upon existing

sanitary conditions. This preliminary matter involves the bacteriological advantages of regulated stream flow.

Mr. Weston testified that from the point of view of pollution and sanitary conditions a regulated stream is better than a non-regulated stream, because under conditions of uniform flow a biological equilibrium is established (R. 3865). The self-purifying power of a river largely depends upon the establishment of purifying biological zones below points of pollution (R. 3865-67). These biological zones can be established only under conditions of fairly uniform flow; and if they are disturbed by frequent sudden rises in stream flow, a considerable period of time is required for their re-establishment with a consequent detriment to rapid self-purification (R. 3867).

Mr. Weston pointed out that a complete regulation of the flow of the Delaware River at the mean stage of 1.71 c.s.m. would greatly improve sanitary conditions since it would eliminate high flows with their temporary destruction of purifying biological zones; but warned that a regulated flow of 1.71 c.s.m. or even 1 c.s.m. is impracticable and too expensive in the Delaware River (R. 3923-24). The impracticability of any such regulation of Delaware River flows was also announced by General Pillsbury in his testimony upon navigation, when he said that the benefit to navigation from a regulated flow of even 1 c.s.m. at Trenton, New Jersey, would not be commensurate with the cost (R. 3654).

The bacteriological advantages of a regulated flow are secured under the Pennsylvania plan of impound-

ing and release during the critical period of low flows in warm weather, when sanitary conditions are at their worst and the detriment from a disturbance of these biological purifying zones is the greatest. That plan eliminates the sudden summer rises that destroy these zones at a time when their purifying action is most needed.

Bearing in mind the foregoing preliminary matters, let us now consider what will be the effect, if any, upon existing sanitary conditions of the upper Delaware River when water is being taken under the Pennsylvania plan of impounding and release. In this regard it should be remembered that the Pennsylvania proofs contemplated a present taking by New York City of 600 m.g.d. and a future total taking by all three States of 1750 m.g.d.; but due to the innate flexibility of the Pennsylvania plan of impounding and release, there will be practically the same absence of material damage during high flows and the same improvement of river conditions during low flows under the reduced taking of 440 m.g.d.

The testimony of Pennsylvania conclusively demonstrates that under the Pennsylvania plan of impounding and release there will be a slight injury at the time of taking during high flows when sanitary conditions are favorable, and there will be substantial benefit from the release of compensation water during the critical period of low flow in warm weather. The Pennsylvania proofs will further demonstrate the superiority of the Pennsylvania plan over the New York plan from a sanitary point of view.

Mr. Weston stated that the taking of water under the Pennsylvania plan at periods of high flow and cool weather will be theoretically harmful but practically inconsequential to the present sanitary condition of the upper Delaware River; and that the increase in flow in warm weather due to the release of compensation water will have a bettering effect (R. 3871-72). He pointed out that sanitary conditions under the Pennsylvania plan will be helped in several ways (R. 3865).

In the first place, the summer flows of the upper Delaware River will be more uniform, thus favoring the establishment of biological conditions antagonistic to B. Coli and the bacteria of water-borne diseases (R. 3865). In the second place, the increases in numbers of B. Coli due to moderately high flows with their attendant scouring of polluting deposits will be minimized (R. 3865). It will be better to have these deposits digest slowly, as they will with a stream better controlled, and not be disturbed every time the river reaches a scouring velocity.

Again the purgative effect of extremely high flows will not be prevented by takings under the Pennsylvania plan, because at many times the impounding reservoirs will be full and the water will be flowing over their spillways (R. 3865). The witness added that the purgative value of extreme floods has not been definitely proved from a sanitary standpoint (R. 3865).

Floods scour the whole catchment area as well as the river bed, and the deposits of sand and silt borne

by the river at a flood stage may or may not be beneficial from a sanitary standpoint (R. 3865-66). These high floods are not necessary for the removal of the lighter deposits of sludge in the vicinity of sewer out-falls, for it must be remembered that stream velocity of slightly more than four feet per second will wear away hard clay deposits (R. 3865). With all the sewage now discharged into the Delaware River treated, no deposits of sludge will occur at sewer outlets or near them (R. 3865).

Mr. Weston further stated that there will be a slight increase in the number of B. Coli under both plans due to a decrease in dilution from the taking of water (R. 3916). He agrees with Dr. Eddy that the taking of water will affect the B. Coli in two ways, namely, by varying their concentration in the upper Delaware River and by varying their mortality or death rate, adding however that the decrease in number of B. Coli due to mortality will seldom, if ever, entirely off-set the increase in B. Coli due to the diversion of water (R. 3859-60).

In a vain effort to prove that the New York diversion (Ex. 4) would have an injurious effect upon the present sanitary quality and condition of the upper Delaware River, New Jersey called Dr. Rudolfs and offered through him Exhibits 185, 186 and 200 which purport to show a direct relation between stream flow and the number of B. Coli in the Delaware River (R. 1194-1204, 1404-09). The fallacy of his testimony and the unreliability of his Exhibits were conclusively established by two diagrams pre-

pared by Mr. Weston and received in evidence as Exhibits 433 and 434. They disclose an entire absence of any direct relation between average flows and average B. Coli and between the numbers of B. Coli and the volumes of discharge (R. 3857-59). This attack of Mr. Weston upon the conclusions and exhibits of Dr. Rudolfs was so telling that no effort was made by New Jersey to answer it at the Trenton rebuttal hearings; and this unsound New Jersey contention has since been completely abandoned.

Having thus shown that the taking of water under the Pennsylvania plan will cause slight and inconsequential harm to the upper Delaware River during high flows and will benefit and improve upstream sanitary conditions during the critical period of low flows in warm weather, our next problem becomes the determination of what damages, if any, will be endured by the lower Delaware River from this upstream taking.

Again, the testimony of Pennsylvania is clear and convincing that the taking of water under the Pennsylvania plan of impounding and release will have little or no harmful effect upon the present sanitary condition of the tidal prism of the lower Delaware River.

Mr. Weston stated that the effect of any change in fresh water stream discharge at Trenton upon the self-purifying capacity of the lower Delaware River will be too small to estimate; and also doubts if the effect can be detected even by a long continued study (R. 3872-73). The population-carrying capacity of

the tidal prism is so largely dependent upon oxygen, and the amount of oxygen is so largely dependent upon the aeration of the river water by absorption of oxygen from the atmosphere, that the small changes in quantity of oxygen brought to the head of tide at Trenton by the Delaware River (which small changes in turn would be during takings or releases by one or more States under either plan) are such small percentages of the amount of oxygen which the lower Delaware River absorbs from the atmosphere that the effect of the changes is too small for consideration (R. 3873).

The witness added that the actual variation in stream flow at Trenton will not affect greatly the conditions of the lower Delaware River at Trenton because there is in the tidal prism the condition of a lake, of which the ocean is the terminal and to which the Delaware River and its tributaries are feeders (R. 3920). There is so large a surface in this tidal section that the oxygen absorbed from the air (which keeps the tidal section in good condition) is so large in amount that the changes due to variation in flow in the Delaware River at Trenton, and the oxygen which these changes supply, are inconsequential (R. 3920). The controlling factor in maintaining the water in the tidal prism in a good sanitary condition is the oxygen dissolved by the water in the prism itself and not that due to variation in flow at Trenton during the takings and releases under the Pennsylvania plan (R. 3921).

Besides, there are 29 miles of tidal flow between

Trenton and Philadelphia; and because the tide oscillates back and forth, it requires between 16 and 17 days for water to travel this distance of 29 miles at the average rate of flow prevailing during the period of Mr. Siebert's observations (R. 3923-24). In this period of 16 or 17 days, the opportunity for reaeration is so great that any changes in pollution due to small changes in flow at Trenton will be completely obliterated (R. 3924).

The solution of all sanitary problems of the Delaware River lies completely in the continued treatment of sewage and industrial waste. In view of the several agreements for the sanitary conservation of the Delaware River (Exs. 425-26), and in view of the 1915 comprehensive plan for the treatment of Philadelphia's sewage and industrial waste (R. 3789-3814, Ex. 427), there need be no fear or cause of alarm for the future sanitary condition of the Delaware River. Furthermore, the Special Master took an important step in the right direction and in consonance with the sanitary policy of all three States when he superimposed as a condition to the present New York taking the requirement that Port Jervis sewage be treated.

Since the taking of water under the Pennsylvania plan of impounding and release will not cause any material damage to the sanitary quality and condition of the upper and lower Delaware River, it is only natural next to inquire whether the Pennsylvania plan of impounding and release is better than the New York plan from a sanitary point of view.

Cogent and powerful proofs were offered by the Commonwealth of Pennsylvania to show that its plan is superior to the New York plan, first when New York alone is taking water, and later when all three States are taking water from the tributaries of the upper Delaware River.

In demonstration of the uncontested fact that the Pennsylvania plan of impounding and release will improve sanitary conditions during the critical period of low flow to a greater extent than the New York plan of impounding and release, Mr. Weston prepared on behalf of Pennsylvania Exhibits 436 and 437, which show the relative effects upon the population carrying capacity of the Delaware River under the two plans for various stretches of the river course (R. 3880-84).

Exhibit 436 indicates that between Hancock, New York, and Trenton, New Jersey, during the period of July 15th to 31st, a taking by New York alone under the New York plan will increase the carrying capacity of the river by 15.3% due to the release of compensation water, whereas the corresponding increase under the Pennsylvania plan will be 32% or more than double the percentage (R. 3881). The computations of this Exhibit show in every instance that the Pennsylvania plan gives a higher population-carrying capacity; and that when all three States are taking there is always a slight detriment rather than an improvement over the New York plan, and a slight improvement under the Pennsylvania plan

during July and August and a detriment during September (R. 3881-82).

Exhibit 437 is a further summary, proving that insofar as population-carrying capacity is concerned, the Pennsylvania plan shows a higher degree of betterment than the New York plan and in some cases nearly twice as much (R. 3882-84).

Mr. Weston testified in conclusion that the effect upon sanitary conditions of the Delaware River when New York City is taking 600 m.g.d., but impounding and releasing water under the Pennsylvania plan, will be to improve sanitary conditions at critical periods of low flow in warm weather by decreasing the density of pollution; and that there will be no appreciable effect upon sanitary conditions during periods of high flows when conditions are favorable (R. 3883-84). He stated that in all events the changes produced by takings and releases when New York alone is taking under the Pennsylvania plan will be far less than the ordinary meteorological changes from year to year, or some times even less than those from month to month (R. 3883-84).

The witness further stated that the effect on sanitary conditions of the Delaware River when all three States are taking, impounding and releasing water in accordance with the Pennsylvania plan, will be similar to the effect produced by New York alone taking under the Pennsylvania plan; and that, if anything, the changes in sanitary conditions will be less, especially in the tidal prism of the Delaware River,

assuming of course that such changes are determinable there (R. 3884).

The final conclusion of Mr. Weston respecting the relative merits of the two plans is that the Pennsylvania plan will best conserve and protect the water of the Delaware River from the point of view of water supply, sewage, industrial waste disposal, reclamation, and industrial use, giving due regard to the rights and convenience of the parties concerned; and that this conclusion applies both when New York alone is first taking water under the Pennsylvania plan, and later when all three States are taking water under that plan (R. 3907).

In conclusion Mr. Weston recommended, as a sanitary engineer, the following policy for the conservation of the Delaware River: first, that those parts which are relatively unpolluted should be conserved in their present condition by every possible means; that the main river above Trenton, New Jersey, should be improved by increasing the degree of sewage treatment; and that the lower Delaware River should be kept as clean as is practicable so that it may still be used for industry and for the dilution of sewage effluent without injury to conditions, and without nuisance even in the vicinity of outfalls from sewage treatment works (R. 3906-07). He is of the opinion that the agreements for the sanitary conservation of the Delaware River (Ex. 425 and 426) are steps in the right direction for the conservation of this river for the benefit of all three States (R. 3907-08).

For the many reasons above stated, the Commonwealth of Pennsylvania respectfully submits that the present sanitary condition of the Delaware River will not be materially harmed under the Pennsylvania plan of impounding and release but will be substantially bettered during the critical period of low flows in warm weather; and that because the Pennsylvania plan of impounding and release is superior to the New York plan under all conditions of taking from a sanitary point of view, the Special Master was correct in adopting and applying the principle of the Pennsylvania plan to the present taking of 440 m.g.d. from the New York tributaries of the upper Delaware River (R. 4950-51).

Before leaving the problem of sanitary conditions in the Delaware River, we desire to call attention to the notorious absence of any New Jersey testimony by state engineers. Although Pennsylvania called in support of its proofs Messrs. Ryder, Stevenson and Siebert, who are leading state engineers in the official employ of Pennsylvania and allowed them to state the policies and the activities of the Commonwealth regarding the many fact issues of the present case, and although New York likewise called its duly accredited officials and permitted them to show what official action had been taken, yet New Jersey did not call a single state engineer in support of its various contentions. On the contrary, counsel for New Jersey relied wholly upon experts imported from other States and obviously unversed in local policies and conditions.

There can be but one plausible explanation of this ominous silence of New Jersey state officials; and that is that counsel for New Jersey did not dare to call them in support of their proofs. Surely this Court as well as the Special Master was entitled to hear the views and opinions of those missing New Jersey officials, especially since they are the parties primarily responsible for state action. And of course the fact that they were state employees would vouch for their sincerity and honesty of purpose. Had New Jersey called its state sanitary engineers, then this Court and the Special Master would perforce have known what Camden and other New Jersey municipalities were doing and intended to do for the treatment of sewage and industrial waste.

2. *The availability of Delaware River water as a source of municipal water supply will not be seriously affected.*

The Special Master found that the effect of the New York diversion (Ex. 4) upon the Delaware River as a source of municipal water supply will be slight and immaterial; and that by decreasing the quantity of the New York diversion and increasing the release of water from impounding reservoirs during low flows in the river, and by treatment of the sewage and industrial waste of Port Jervis, there will be no appreciably adverse effect on the waters of the Delaware River as a source of municipal water supply (R. 4883).

New York City and State have alone excepted to

this finding by the Special Master. New Jersey has apparently abandoned the allegation of its bill of complaint that the New York diversion would substantially harm the Delaware River as a source of municipal water supply.

The Special Master prefaced his discussion of municipal water supply from the Delaware River by observing that this subject had already been discussed to a considerable extent under the heading "Sanitation" in his Report (R. 4880). This same observation applies with equal force to the Pennsylvania brief. These two subjects are so closely akin that it was impossible to differentiate to any great degree the Pennsylvania proofs; and therefore much that was said in the preceding sub-heading on sanitation is equally applicable to the present sub-heading on municipal water supply.

The Special Master pointed out that on the Pennsylvania side of the Delaware River, Philadelphia now takes 60% of its water supply and the City of Chester takes its entire water supply from said river; and that under existing conditions, all water taken from that source by New Jersey and Pennsylvania municipalities must be filtered and purified before being delivered through pipes to the consumer (R. 4880-81).

The findings of the Special Master regarding municipal water supply from the Delaware River are fully sustained by the Pennsylvania proofs. Mr. Weston summarized his general opinion regarding the availability of Delaware River water as a source of public supply as follows: that the upper tributaries of the

Delaware River in all three States are favorable sources of water supply which may be conserved indefinitely; that the main river between Hancock, New York, and Trenton, New Jersey, is a suitable source of raw water for supplying municipalities through modern water purification plants, and for supplying industries; and that by proper treatment of sewage and industrial waste the upper Delaware River may be maintained in this condition indefinitely (R. 3905-06).

That the lower Delaware River is an inferior source of raw water supply except at certain points, and is also highly polluted in places, noticeably between Frankford and Chester along the Pennsylvania shore, and near the City of Camden along the New Jersey shore; that treatment of sewage and industrial waste causing this pollution will greatly relieve the burden from purification plants and temporarily reduce the pollution in the lower river; and that increasing population with its increased cost of sewage will cause the abandonment of the lower river as a source of water supply, but it will still continue to be the main drainage channel for Philadelphia and other municipalities, and as such may be used indefinitely and without nuisance (R. 3905-06).

Realizing fully that common decency as well as increasing pollution must eventually cause Philadelphia and Eastern Pennsylvania to abandon their present heavily polluted water supply from the lower Delaware River for a pure upland source of supply with its manifold advantages, the Pennsylvania engi-

neers in formulating their plan of impounding and release developed a plan to supply the present and reasonable future needs of Philadelphia and Eastern Pennsylvania from the pure Pennsylvania tributaries of the upper Delaware River which had already been classified by the State Sanitary Water Board as Class "A" streams, suitable for a domestic and municipal water supply.

In support of this plan for a pure upland source of water supply, the Commonwealth of Pennsylvania through its engineers presented testimony and supporting data to show (1) the present and reasonable future water needs of Philadelphia and Eastern Pennsylvania, (2) the compelling grounds for such a move upstream, (3) the many reasons why the Pennsylvania tributaries of the upper Delaware River constitute the best as well as the sole available source for a future water supply for Philadelphia and Eastern Pennsylvania, (4) the adequacy of said tributaries as such a future source of water supply, (5) the competitive character of this water supply area in the absence of proper control and regulation, and (6) the necessity for a present allocation of the waters from these tributaries to Philadelphia and Eastern Pennsylvania. A summary of such testimony and supporting data will be found in a subsequent section of this brief (pp. 163-177, *infra*).

Having thus shown the urgent need for a present allocation of Pennsylvania's fair and equitable share in the waters of the Pennsylvania tributaries of the upper Delaware River, the Commonwealth of Penn-

sylvania requested the Special Master to make such an allocation to Philadelphia and Pennsylvania. This request was in furtherance of the basic principle of Pennsylvania's intervention, namely, that the interstate waters of the Delaware River and its tributaries should be fairly and equitably apportioned between the three States; and was also in accordance with the corollary proposition of law that no apportionment of the waters of an interstate stream can possibly be complete without a present allocation to each State of its fair and equitable share.

The Special Master dismissed without prejudice this Pennsylvania contention, stating, *inter alia,* that until a definite plan to resort to the Pennsylvania tributaries of the upper Delaware River had been formally adopted and approved by the proper state authorities, this Court lacked jurisdiction to make the desired allotment because Pennsylvana was, in substance, asking for a declaratory judgment of its rights (R. 4949-50). He recommended, however, that the present cause be retained in court for proper application relative to this and other features as to which there has been a decision without prejudice (R. 4970, 4972).

Relying upon this retention of jurisdiction, the Commonwealth of Pennsylvania filed no exception to the dismissal without prejudice of its plea for a present allocation of Pennsylvania's fair and equitable share in the waters of the Delaware River and its tributaries. As soon as a definite plan to take water from this upland source of supply has been

formally adopted and approved by the proper state authorities, an application will be made by the Intervenor for such an allocation and allotment.

Such an application will not only be in discharge of the Commonwealth's highest police duty as a sovereign, but will also be in recognition of one of the fundamental principles of the Pennsylvania proofs, namely, the provision and assurance of a pure and wholesome water supply for the domestic and municipal needs of Philadelphia and Eastern Pennsylvania. Messrs. Weston, Swaab, Morgan, Stevenson and Ryder are unanimous in their testimony that the highest and most valuable use of water is for a domestic or municipal water supply. Mr. Stevenson testified that the Pennsylvania Sanitary Water Board has erected the following order of precedence for the utilization and conservation of the water resources of the Commonwealth, namely: (1) sources of supply for domestic and municipal water works, (2) sanitation, *i. e.,* the conveyance of sewage and industrial waste after suitable treatment, when and where needed, (3) manufacturing and industrial uses, power and agriculture, and (4) navigation (R. 3782-83).

In conclusion, we submit that the Pennsylvania proofs on sanitation and water supply entirely warrant the finding by the Special Master that under the Pennsylvania plan of impounding and release, which substantially increases the natural flow of the Delaware River during the critical period of low flows, the availability of the Delaware River as a source of municipal water supply will be preserved

until the time when Philadelphia and Eastern Pennsylvania shall abandon their heavily polluted downstream source for a pure upland supply from the Pennsylvania tributaries of the upper Delaware River.

3. *The use of its waters for industrial purposes will not be materially harmed.*

The Special Master found that on the whole the effect of the New York diversion (Ex. 4) will be to impair but slightly the use of Delaware River water for industrial purposes; and that by decreasing the New York diversion and increasing the quantity of water released during low flows and by the treatment of sewage and industrial waste at Port Jervis any damage to the use of Delaware River water for industrial purposes will be inconsequential (R. 4893-94). In order to increase the quantity of water released during low flows, the Special Master recommended the adoption and application of the principle of the Pennsylvania plan of impounding and release (R. 4819-20).

New Jersey has excepted to this finding by the Special Master because it believes that the proposed New York diversion will cause a substantial increase in hardness which in turn will substantially increase the cost of industrial operations. New York City and State have also excepted to the finding insofar as it holds that any damage will result from the New York diversion (Ex. 4) to the industrial use of Delaware River water.

In support of his finding, the Special Master pointed out that there will undoubtedly be times when there will be some impairment of the water for industrial purposes and that there will also be times, when by increasing the flow of the river, there will be some improvement of the water for said purposes (R. 4893-94). This observation by the Special Master confirms another basic principle of the Pennsylvania plan of impounding and release, namely, that water may be impounded at high flows when industrial conditions are favorable and the injurious effect thereof will be slight to the end that the natural flow may be augmented during periods of low flow when conditions are adverse to industrial uses and river conditions may be correspondingly improved.

New Jersey claimed by its bill and proofs that the contemplated New York diversion will greatly increase the hardness and salinity of Delaware River water and so prevent its continued use for industrial purposes. Because of the extensive and vast industrial interests of Philadelphia and Eastern Pennsylvania, this alleged injury was studied with the greatest of care by the Pennsylvania engineers. After an exhaustive study of all the facts, they decided that there will be no appreciable effect upon hardness and salinity under the Pennsylvania plan of impounding and release.

Since hardness and salinity are two wholly unrelated subjects, the Pennsylvania proofs regarding them will be separately discussed. Under each subject, we shall first consider existing conditions and

then show how they will be affected and changed by the taking of water under the Pennsylvania plan of impounding and release.

There are two kinds of hardness in the Delaware River, one of which is known as temporary hardness or alkalinity and is shown by the 1929 State Sanitary Survey (Ex. 430), and the other is permanent or sulphate hardness and can be determined from the alkalinity at various points along the Delaware River by using the proportion of 1 to 1.5 (R. 3847, 3887-88). Above the confluence of the Delaware and Lehigh Rivers at Easton, hardness in the Delaware River is temporary and averages 17.8 p.p.m. (R. 3885-87, 3895-96). The Pennsylvania tributaries of the upper Delaware River are likewise temporarily hard with an average of 21 p.p.m. (R. 3885-88, 3895-96). Below Easton, permanent or sulphate hardness enters into the Delaware River due to the fact that the Lehigh River is permanently hard from the sulphates resulting from the reaction of sulphuric mine waste acid upon the limestone belt in Berks and Lebanon Counties which the Lehigh drains (R. 3885-88, 3895-96). This permanent hardness grows progressively higher downstream and attains an average of 65 p.p.m. at Philadelphia's Torresdale water intake.

In reaching his conclusions regarding hardness in the Delaware River, Mr. Weston relied not only upon the many sources of information available to him (R. 3886-87), but also studied the testimony and diagrams presented by Mr. Powell as part of New Jersey's case and purporting to show the relation

between hardness and stream flow (R. 3886-88). Noting that the Powell diagrams misrepresented the relation between hardness and stream flow for the highest and the lowest flows in the Delaware River, he first recast the New Jersey data under the more precise mathematical process, known as "Theory of Probabilities," and then redrew the Powell curve on hardness (R. 3887-88, 3943-44).

The recast Powell curve was admitted as Exhibit 438 and proves that the original Powell curve overstates the hardness corresponding to the lower flows and gives no figures for the hardnesses corresponding to the higher flows (R. 3889-90).

The error in the original Powell curve (Ex. 205) can best be illustrated by the following three column table that compares the two curves at various stages of the Delaware River, hardness being expressed in parts per million and stream flow in cubic feet per second (R. 3889-90).

Flow	*Hardness p.p.m.*	
c.f.s.	*Powell*	*Weston*
2,000	100	89
3,000	82	74
4,000	66	62.5
6,000	56	53.5
10,000	47	45.5
20,000	35	34.5
25,000	31	30
40,000	21	22.25
60,000	No Plotting	20.5
70,000	No Plotting	20.4

Mr. Powell admitted at the Trenton rebuttal hearings that Mr. Weston had re-cast the original curve (Ex. 205) along the lines of accepted engineering mathematics (R. 4114) and that the re-cast Weston curve was more accurate than the original curve for the higher and possibly the lower points (R. 4125-26).

The real significance of the Powell curve (Ex. 205) as re-cast by Mr. Weston (Ex. 438) lies in the fact that the hardness of the Delaware River rapidly increases with each small decrease in flow at the lower stages but only slightly decreases with substantial increases in the flow at higher stages (R. 3888-89). This natural phenomenon was explained by Mr. Weston upon the ground that the hardness of Delaware River water will increase as stream flow decreases until the hardness becomes that of ground water which is fairly constant and does not get above a certain maximum (R. 3894-95). On the other hand, hardness will decrease as stream flow increases until the hardness ultimately approaches that of quickly running off rainfall (which is materially soft) when stream flow reaches its maximum (R. 3894-95).

The Pennsylvania plan takes advantage of this natural law to the great benefit of the Delaware River when it provides for the impounding of water at high flows and the release of compensation water at low flows. The slight increase in minimum hardness resulting from the takings at high flows is largely compensated by the considerable decrease in maximum hardness caused by the release of water during low flows (R. 3356).

Counsel for New Jersey throughout their section upon hardness refer to the uncontradicted testimony of Mr. Weston and Mr. Powell that hardness increases as flow decreases but ignore the true significance of this natural law, namely that a slight decrease in low flows greatly increases the hardness, whereas a very large decrease in high flows causes a very slight increase in hardness. For example, the impounding of 10,000 c.f.s. for water supply purposes when the natural stream flow is 70,000 c.f.s. will increase hardness but 0.1 p.p.m., whereas the release of 1,000 c.f.s. of compensation water under the Pennsylvania plan when the natural flow is but 2,000 c.f.s. will decrease hardness some 15 p.p.m. To acknowledge this feature of the relation between hardness and stream flow is to admit Pennsylvania's proofs upon hardness; and, therefore, New Jersey counsel suppress it in order to save their averment of substantial damage under the Pennsylvania plan of impounding and release.

From the point of view of industrial use, the present hardness of Delaware River water is of twofold importance. In the first place, it determines its fitness for boiler and condenser purposes; and in the second place it controls the costs of softening that water for certain industries.

Delaware River water is now used extensively in boilers and condensers; and much evidence was taken for and against its present suitability for those industrial purposes. The experts disagree as to the fitness of Delaware River water for use in boilers.

This disagreement is largely predicated upon a divergence in view regarding standards for boiler water.

Mr. Weston testified that standards of hardness for water to be used for boiler purposes vary greatly and are not fixed for any part of this country (R. 3890). Water that would be called hard in Easton, Pennsylvania, would be called soft in Illinois (R. 3890). The standard adopted by the American Railway Engineer and Maintenance of Way Association classifies water for boiler uses as follows (R. 3890-91):

Class	*Hardness p.p.m.*
Very good	0 to 70
Good	70 to 150
Fair	150 to 250
Bad	250 to 400
Very Bad	400 and above

The witness stated that this standard, although empirical, represents the idea of an important body of boiler water users (R. 3891); and that in his judgment Delaware River water of less than 70 p.p.m. is good water for use in low pressure boilers and that water over 70 p.p.m. is only fairly good (R. 3891). He hesitates to recommend a hardness of 100 p.p.m. as a standard water for low pressure boilers although the New York witness, Mr. Orrok, has so expressed himself and his statement voices the opinion of the majority of steam boiler operators (R. 3890, 3943). He believes that most boiler operators will, however, call a water having the hardness of 100 p.p.m. or less a good boiler water if such hard-

ness is not a mineral acid hardness due to sulphates but represents a mixture of carbonate and sulphate hardness in average proportions (R. 3890).

During the course of the New Jersey rebuttal testimony, Mr. Powell took issue with Mr. Weston's statement that water of a hardness less than 70 p.p.m. was good for boiler feed use and declared that a hardness of 70 p.p.m. might do very great damage in a boiler, especially a high pressure boiler; and that in the most modern types of boilers the water must be as free from hardness and other mineral solutions as it is possible to obtain (R. 4114-15).

This rebuttal evidence completely overlooks the fact that Mr. Weston was speaking solely of low pressure boilers and specifically stated that high pressure boilers are usually operated with distilled water (R. 3890). It also ignored the standard for boiler water as prescribed by the American Railway Engineers and Maintenance of Way Association which unquestionably is the largest body of boiler water users (R. 3890-91).

All of the experts agree that Delaware River water is at the present time suitable for use in condensers. Mr. Weston testified that he had studied this question and that in his opinion upper Delaware River water is a very good water for use in condensers except where it is affected by drainage from coal mines, and this occurrence does not enter into the case now under consideration (R. 3893). He is also of the opinion that the water of the lower Delaware River is suitable for use in condensers (R. 3893).

He stated that the water should be screened in order to keep debris out of the condenser tubes; and that this is more true of the lower than the upper Delaware River (R. 3893).

Mr. Powell stated in the course of his rebuttal testimony that he disagrees with Mr. Weston's opinion that Delaware River water is a good water for use in condensers, and bases his disagreement upon the presence of organic matter, algae and aquatic plant life which is detrimental to the use of this water for condenser purposes (R. 4115-16). He claims that these detrimental factors will increase as the dilution water decreases (R. 4115-16). However, this contention utterly disregards the well known fact that these "detrimental factors" are most prevalent at periods of low flow and will therefore be materially decreased by the release of compensation water under the Pennsylvania plan of impounding and release.

Anent the costs of softening Delaware River water, Mr. Weston stated that he estimates the average hardness along the river during 1929 as follows: at Holland, 44.5 p.p.m.; at Trenton 50.9 p.p.m.; at Torresdale 65.1 p.p.m.; and at Chester 65.8 p.p.m.; and that it will not pay to soften such waters except for certain industrial processes requiring an extremely soft water (R. 3892-93). The zeolite process is the only softening process suitable for these industries (R. 3893).

He further stated that a zeolite plant roughly costs $20,000 for a million gallon capacity daily; and that

to operate such a plant for an average hardness of 50 p.p.m. it will cost between $10.00 and $12.00 per million gallons, exclusive of fixed charges (R. 3893-94).

In confirmation of this cost estimate, the witness alluded to the municipal zeolite plant at South Orange, New Jersey, which softens 1.1 m.g.d., having a hardness of 140 p.p.m., at a cost of $22.52 per million gallons (R. 3894). This scale of cost included labor, heat, lighting and all incidentals (R. 3893). Upon that basis it will cost $8.70 per million gallons to operate a zeolite softening plant at Holland on the Delaware River (R. 3893).

A zeolite plant usually requires the primary filtration of the water to be softened (R. 3946). The investment cost of a primary filter will be $20,000. per million gallons, and the cost of purification will be from $5.00 to $8.00 a million gallons (R. 3946). However, there is no need for primary filtration at Philadelphia because all water served in that City is filtered under the existing system of water supply (R. 3377, 3946).

Mr. Powell took issue with Mr. Weston upon the investment cost, as well as the operative cost, of a zeolite plant (R. 4119-22). He conceded that the softeners alone can be purchased possibly for $20,000., but contended that a complete system, which is essential to the purification and softening of Delaware River water, cannot be built for that sum (R. 4119-20).

He referred to the Vacuum Oil Company plant

that cost $102,000. per million gallons daily, and the Baltimore City plant that cost $53,000. per million gallons daily (R. 4120). He also stated that the complete cost of operating the zeolite plant of the Vacuum Oil Company at Paulsborough is $33.40 per million gallons per grain of hardness removed (R. 4121-22). The witness wholly failed to supply counsel with data substantiating these costs in these few special cases despite his promise to do so (R. 4124).

Turning now to what effect, if any, the taking of water under the Pennsylvania plan will have upon the present condition of hardness in the Delaware River, the Pennsylvania proofs in this respect are predicated upon a present taking of 600 m.g.d. by New York City and a probable future taking by Pennsylvania of 750 m.g.d. and by New Jersey of 400 m.g.d., which latter two amounts denote the estimated 1980 needs of Delaware River water by these two States. Mr. Weston prepared and submitted diagrams and computations (Exs. 439-40) showing the relative changes in hardness at Torresdale (Philadelphia) during the year 1929 under various takings of Delaware River water pursuant to the Pennsylvania plan of impounding and release (R. 3898-3900).

The computations show that when New York alone is taking under the Pennsylvania plan the average annual hardness at Torresdale for 1929 will be increased 3.1 p.p.m., and that during August and September the average monthly hardness will be respectively reduced 3.5 and 1.9 p.p.m. (Ex. 439).

The diagram (Ex. 440) shows that the greatest increase in hardness will result when all three States are taking under the Pennsylvania plan of impounding and release, that the least increase in hardness will result when New York and New Jersey are taking, and that the effect is greater on the average when New York alone is taking than when New York and New Jersey are taking (R. 3899-3900). What is especially significant about this diagram is that under all three assumptions of taking the effect upon hardness during the months of July, August and September, when releases are being made, is to decrease it to a point substantially below existing conditions of hardness (R. 3899-3900). The maximum decrease is more than 4 p.p.m. (Ex. 440).

The comparative effect upon hardness at Torresdale under the Pennsylvania and New York plans and under all conditions of takings can be best summarized in the form of a concise table reading as follows (R. 3903-04):

		Average Change in Hardness	
Taking	*Plan*	*p.p.m.*	*percentage*
New York	New York	+2.9	+5.2
New York	Pennsylvania	+3.1	+5.5
3 States	New York	+7.7	+12.5
3 States	Pennsylvania	+7.9	+12.9
New York & New Jersey	New York	+2.0	+3.4
New York & New Jersey	Pennsylvania	+2.1	+3.4

Mr. Weston explained that the Pennsylvania plan shows a slightly higher figure of hardness than the New York plan because relatively more water is taken under the Pennsylvania plan during the winter portion of the year so that the total effect is to increase hardness (R. 3904). He attaches no significance whatever to the slight increase in hardness under either plan (R. 3904). As previously stated the significant fact about the Pennsylvania plan is that hardness is decreased materially during July, August and September, the time of year when hardness is at its maximum due to low flows (R. 3900).

Mr. Weston also determined that the effect upon sulphates in the lower Delaware River will be minimal and unimportant under the Pennsylvania plan when all three States are taking and also when New York alone is taking (R. 3904-05). This holds equally true for other points along the river such as Trenton and Holland (R. 3905).

These conclusions of the witness are based upon results of determinations of sulphates by the Bureau of Water of the City of Philadelphia at the Torresdale intake for the comparatively long period of January, 1921, to September, 1929, inclusive (R. 3904). Using the same method that Mr. Powell used to compare flows and hardness at Riegelsville, the witness determined that the range of variation in sulphates for all stages of the river is 14 to 23 p.p.m.

The relation between flow and sulphates may be briefly illustrated by the following tabulation (R. 3905):

Flow in c.f.s.	*Sulphates in p.p.m.*
30,000	15.0
15,000	15.5
10,000	16.2
5,000	18.0
2,500	21.0
2,000	22.3

In view of this relation between stream flow and sulphates the conclusion is well justified that the effect upon sulphates will be minimal and unimportant under all takings under both plans at high flows (R. 3905).

Upon cross examination Mr. Weston stated that the accession of fresh water between Holland and Torresdale will cause the percentage of sulphates to vary about one part per million; and because of this small variation the percentage of sulphates at Holland, New Jersey, will be greater when water is being taken under either plan and will be less when water is being released under either plan (R. 3916-17). There are no considerable accessions of sulphate at points below Holland, which means that any accession of fresh water below Holland will change the percentage due to dilution (R. 3916-17).

So far as the effect of the Pennsylvania plan upon the costs of softening Delaware River water is concerned, Mr. Weston testified on cross examination by New York City that the hardness of that water is always greatest at low water stages, and that the investment costs of a zeolite softening plant depends upon the maximum hardness that it will be called upon

to handle (R. 3949). For this reason the water released during the summer time will, by decreasing the hardness, reduce the cost of softening and of the zeolite plant (R. 3949).

Corroborative of this testimony, the witness stated on direct examination that Delaware River water is now so soft that any other method of softening than the zeolite method cannot be considered as applicable to the conditions; that the only difference in the cost of a zeolite process of softening due to an increase or decrease in hardness from the taking of water will be in the amount of salt required to regenerate the zeolite after its period of activity expires and it must be regenerated; and that under the New York plan with all three States taking, the hardness during 1929 will be increased 2.2 p.p.m. which requires 55 pounds more of salt to soften a million gallons than under natural conditions (R. 3900-01). With salt at ½ cent a pound this is equivalent to 0.28 of a mill per thousand gallons (R. 3901).

Finally, the witness stated that with all three States taking water under the Pennsylvania plan the increase in hardness at Trenton will be 4.5 p.p.m. which will increase the cost of salt for softening in the zeolite process at the rate of 0.57 mills per thousand gallons (R. 3904). This increase in cost is so small in comparison with the changes due to yearly, monthly or weekly changes in hardness, and in flow, that it is inconsequential (R. 3904).

At the Trenton rebuttal hearings, Mr. Powell dis-

puted Mr. Weston's statements regarding the increase in cost of softening Delaware River water and asserted that under the New York diversion (Ex. 4) the additional cost of softening Delaware River water, based on an increased hardness of 2.2 p.p.m. and treating 2 m.g.d., will be $3175. per year; but on cross examination he was forced to admit that the increase of 2.2 p.p.m. in hardness related to when all three States were taking their quota of water under the Pennsylvania plan (R. 4123-25).

The above Pennsylvania proofs upon hardness clearly establish the correctness of the finding by the Special Master that the effect of the New York diversion (Ex. 4) upon hardness in the Delaware River will be slight and immaterial and also demonstrates how unwarranted is the New Jersey contention that there will be substantial damage because of the greatly increased cost of softening Delaware River water. The adoption and application of the Pennsylvania plan of impounding and release will substantially improve conditions of hardness in the Delaware River during low flows when hardness is at its maximum and will therefore reduce the installation as well as the operation costs of softening processes.

It thus appearing from the Pennsylvania proofs that the effect upon hardness in the Delaware River will be slight and inconsequential, let us now consider the present conditions of salinity in the lower Delaware River and what effect, if any, a taking under the Pennsylvania plan of impounding and release

will have upon that condition. Of course the discussion regarding salinity is necessarily confined to the tidal prism of the lower Delaware River, that is from Trenton, New Jersey, down to Delaware Bay.

Mr. Weston testified that he has made a study of salinity in the waters of the lower Delaware River and is familiar with its salinity conditions (R. 3897). The sources of information include the records of the Chester Water Service Company for a number of years (R. 3897). This company is one of the clients of his firm (R. 3897).

As a result of his studies the witness found that no ocean water reaches Chester, Pennsylvania, and that all the water passing Chester is land and not sea water (R. 3897-98). This is conclusively shown by the fact that the maximum salinity expressed as chlorine, which occurred on September 22 and 28, 1924, was 28 p.p.m. (R. 3897-98). This finding accords with the statement by Mr. Swaab that the upstream range or limit of salt water is at Delaware City, Delaware, and that brackish water has never been known to reach Philadelphia, even in extreme emergencies (R. 3419).

The witness tabulated the average in maximum chlorine for the past six years as follows:

	Parts per Million	
Year	*Average*	*Maximum*
1924	13.5	28.0
1925	14.5	26.5
1926	11.2	22.5
1927	13.0	19.5
1928	9.9	19.0
1929	10.8	16.7

The year 1929 is a very useful year from the standpoint of a study of stream conditions (R. 3897). The mean annual flow at Trenton was 1.71 c.s.m. or 11,650 c.f.s. which is nearly the same as the average flow for the entire period between 1913 to 1929 (R. 3897). In conjunction with this year of normal or average flow there was an extremely dry summer (R. 3897-98). Yet with this year of normal flow and with a low summer the variations in chlorine at Chester were between 4 and 16.7 parts per million.

Mr. Weston concluded his testimony upon salinity with the statement that there will be no appreciable effect upon salinity in the lower Delaware River under the Pennsylvania plan of impounding and release, first when New York alone is taking and later when all three States are taking their respective shares of water (R. 3895).

Mr. Swaab corroborated the testimony of Mr. Weston upon salinity and stated that with all three States taking a total of 1750 m.g.d. from the Delaware River and its tributaries salt water would not come up the lower Delaware River with the tides any further than it comes today (R. 3416-19). He further stated that the head of salt water today was at Delaware City and that under a taking of 1750 m.g.d. he doubts whether it would make any material difference in salinity conditions and is certain that the salt water in the tide would never reach the League Island Navy Yard at Philadelphia (R. 3419).

The New York witness, Mr. Hazen, likewise stated that the proposed diversion of 600 m.g.d. under the

New York plan (Ex. 4) will not increase the distance that salt water penetrates upstream in the tidal prism of the Delaware River (R. 2965-66). This statement is predicated upon the uncontroverted principle that the run of salt upstream is greatest in a long continued spell of low flows (*i. e.*, a thirty day minimum); and that an especially low flow for a few days will not make much difference (R. 2966).

Under the New York plan (Ex. 4) a minimum thirty day flow in the Delaware River will never be decreased, and, insofar as it is changed at all, it will be increased (R. 2966). Under these conditions salt water from the sea will not penetrate farther upstream than it does at present (R. 2966). If there is any change under the New York plan (Ex. 4), salt sea water will stop slightly farther downstream but the change will be too slight to be capable of being observed by any method that can be suggested (R. 2966).

At the rebuttal hearings at Trenton no effort was made on the part of New Jersey to rebut in any manner the testimony of Mr. Weston and Mr. Hazen that there will be no appreciable effect upon salinity under either plan, and that any change in salinity will be for the better because of the increase in flow during periods of low flow, thereby driving salinity downstream rather than permitting its penetration upstream.

The foregoing proofs clearly establish that there will be no substantial damage to the suitability and availability of Delaware River water for industrial

uses under the Pennsylvania plan of impounding and release; that present conditions of hardness and salinity will be slightly impaired at high flows, when such injury is of little or no consequence; and that during time of low flow, when conditions of hardness and salinity are at their worst, there will be a marked improvement in river conditions to the great benefit of industries, the methods and processes of which are controlled by maximum adverse conditions.

Before closing our discussion of salinity conditions in the lower Delaware River, we desire to present to this Court certain facts and events that do not appear in the record of the present case because they have occurred since the closing of proofs at the Trenton rebuttal hearings on September 19, 1930. These facts and events have an important bearing upon the Pennsylvania proofs regarding salinity and form the basis for the present application by the Commonwealth of Pennsylvania that this Court so mould its decree as to protect Philadelphia and Eastern Pennsylvania against the possibility of adverse salinity conditions.

Late in the fall of 1930 and at the end of a severe drought of many months, there was an unprecedented penetration of brackish water upstream with the result that the saline content of Delaware River water in the vicinity of Chester exceeded by many times the maximum chlorine observed during the past six years, as testified to by Mr. Weston without contradiction. This brackish water for the time contaminated the domestic water supply of the City of Chester and caused serious inconvenience and substantial damage

to numerous large Pennsylvania industries located along the Delaware River in that vicinity and using river water.

Thoroughly alarmed at these abnormal salinity conditions, the engineers and representatives of the Pennsylvania industries met by agreement in early December, 1930, with the Attorney General and his Pennsylvania engineeers at a Harrisburg conference, where the engineers for the Pennsylvania manufacturers presented in detail all data in their possession regarding salinity in the lower Delaware River with particular reference to recent developments and advanced their theory that the permanent diversion of water from the Delaware River watershed, such as the proposed New York taking of 440 m.g.d., will not only adversely affect salinity conditions in the tidal prism but will also increase the frequency and intensity of the penetration of brackish water upstream.

After a most careful study of not only the salinity data thus presented by the Pennsylvania manufacturers but also of all further data on past and present salinity conditions that could be obtained, the Pennsylvania engineers submitted a report to the Attorney General in which they stated, *inter alia,* that the salinity data thus presented and available did not warrant a change in the Pennsylvania proofs upon salinity or a modification of their previously expressed belief that under the Pennsylvania plan of impounding and release there would be no substantial adverse effect upon salinity conditions in

the lower Delaware River. They also expressed the opinion that, had the Pennsylvania plan of impounding and release been in operation in 1930, there would have been an improvement in the adverse salinity conditions by reason of the release of compensation water to increase the natural flow during the protracted period of low flow in that year.

Because the available records on salinity in the lower Delaware River are fragmentary and incomplete, the Commonwealth of Pennsylvania acting upon the advice of the Attorney General and his engineers has introduced into its legislature a bill that provides for a complete and searching two year survey of chlorides in the lower Delaware River under the direction and supervision of the State Sanitary Water Board. The primary purpose of this survey is to obtain complete data regarding the so-called marginal zone of salinity in the lower Delaware River and to determine the many factors and laws that govern the movement of this marginal zone upstream and downstream with the variations in flow of the Delaware River and its many tributaries both above and below Trenton, New Jersey, and the resulting effect upon the lower Delaware River for water supply purposes.

This bill also calls for a survey and study to determine the feasibility, most available location for and cost of an industrial reservoir for impounding and distributing to industries along the Delaware River in the neighborhood of Chester water for industrial use, taken from the Delaware River at a point safely

above the salinity line in the event that the taking of water by New York should increase the salinity of the river in that vicinity to such an extent as to render the water at that point unfit for industrial use.

Since the introduction of that bill in the Pennsylvania Legislature, counsel representing the City of Chester has conferred with the Attorney General and stated that his client believes that the proposed taking by New York of 440 m.g.d. will so adversely affect salinity conditions at the intake of its water works as to render Delaware River water unfit for further use as a source of domestic supply for the 150,000 people dependent upon it. Engineers retained by the City of Chester are now assembling their data on salinity and will confer with the Attorney General and his Pennsylvania engineers at an early date.

Although the Pennsylvania engineers are of the opinion that the salinity data thus far presented and available does not warrant a change in their original conclusion that the proposed New York taking of 440 m.g.d. pursuant to the Pennsylvania plan of impounding and release will not adversely affect salinity conditions in the lower Delaware River, yet the Commonwealth of Pennsylvania, as *parens patriae*, believes that this group of important Pennsylvania manufacturers as well as the City of Chester and its 150,000 domestic water users are in equity and good conscience entitled to the further assurance, which this two year survey of salinity conditions can alone

give them, that their interests are completely safeguarded. The Special Master has already pointed out that under the proofs in this case it will probably be ten years before there is any actual taking by New York from a tributary of the Delaware River (R. 4952).

This long delay in any actual taking of water by New York will afford more than ample opportunity for the Commonwealth of Pennsylvania to complete its two year survey of salinity conditions in the lower Delaware River; and if that survey discloses the necessity for any qualification or change in the Pennsylvania proofs on salinity before the Special Master, there will also be ample time to present such additional data to this Court and to ask such relief as may be necessary and appropriate. If, on the other hand, the two year survey confirms the Pennsylvania proofs, as the Intervenor anticipates, then New York will not have suffered serious inconvenience or damage and the fears of the Pennsylvania manufacturers and the City of Chester will have been finally and forever allayed and dispelled.

In conclusion, therefore, the Commonwealth of Pennsylvania now asks this Court in affirming the findings, conclusions and recommendations of the Special Master to enter a decree that will (1) be without prejudice to the right of the Intervenor to submit further proofs upon the completion of the two year salinity survey, if found necessary, and (2) provide that the present New York taking is not only

expressly conditioned upon the payment of compensation for any damage thereby shown to have been caused to Pennsylvania's interests, but is also subject to such further equitable relief as may thus be proved necessary and appropriate.

4. *There will be no substantial damage to agriculture and fishing.*

The Special Master found that the New York diversion (Ex. 4) will have a very slight adverse effect on agriculture; and that such slight adverse effect will be very largely, if not entirely, overcome by the modification of the New York plan as set out in his Report (R. 4907). He observed that agriculture was a diminishing rather than an increasing activity on the New Jersey side of the Delaware River and that the best sales of such New Jersey lands were for recreational rather than for agricultural purposes (R. 4906-07).

The Special Master also found that the New York diversion (Ex. 4) will probably have little damaging effect on the shad industry; and that such slight effect will be largely, if not altogether, removed by the limitations imposed by the Special Master upon the present New York taking (R. 4914-15). He observed that pollution had been a much greater factor in decreasing the run of Delaware River shad than any natural variation in stream flow (R. 4915).

New Jersey has seen fit to file no exceptions to the findings by the Special Master that the New York

diversion (Ex. 4) will have a slight and immaterial effect on agriculture and fishing. New York City and State have excepted to these findings insofar as they hold that any damage will result from the New York diversion (Ex. 4) to agriculture and fishing.

These two alleged elements of damage are *de minimis* and merit scant attention. The Pennsylvania proofs show beyond peradventure that under their plan of impounding and release any damage to these two interests will be minimal and inconsequential.

Insofar as agriculture is concerned, Mr. Arthur E. Morgan, who had planned with his associates the reclamation of approximately 2,000,000 acres of agricultural land and had spent six months in studying the feasibility of reclaiming certain muck areas in the Delaware River basin for agricultural purposes (R. 3187, 3700-02), testified on behalf of Pennsylvania that the wooded New Jersey bottom lands along the Delaware River are not worth clearing (R. 3701-03, 3728); and that said bottom lands got their moisture for crops from rainfalls and not from capillarity from the Delaware River (R. 3704). Both the New Jersey and the New York proofs disclose that not more than one-half of the 3650 acres of New Jersey bottom lands are now under any sort of cultivation; and that their present market value for agricultural purposes in their present condition is markedly low (R. 1943, 1984-85, 1998, 2841-53, 2887, 3701-03, 3993-96).

The gravamen of the New Jersey charge of damage

to agriculture is that their Delaware River bottom lands depend for their moisture upon the ground water table or level which is in turn governed by the river stage; and that the lowering of stream flow under the New York diversion (Ex. 4) will proportionately lower the ground water table or level and thus seriously injure the crop yield (R. 1960-89, 1996-97, 2007-09, 2029-43, 2044-50). The fallacy underlying this alleged direct relation between river stage and ground water table or level rests upon the failure of New Jersey to recognize that the Delaware River is the lowest drainage outlet in this valley so that the river stage is always below the ground water table or level and the relation between the two is that of a parabola (R. 2861-62). Convincing proof of this parabolic relation is afforded by the numerous springs and sidehill seepages along the inner edge of the Delaware River valley bottom, where this bottom joins the lower slope of the valley side (R. 2861-62, 2876-79). In further proof that the ground water table or level does not raise or fall with the river stage is the uncontradicted fact that lateral seepage of water from the Delaware River will not penetrate more than a distance of fifty feet from its banks (R. 2876-77).

Insofar as fishing is concerned, the alleged damage from the New York diversion (Ex. 4) is predicated upon the unsound New Jersey contention that there is a direct relation between stream flow and the catch of Delaware River shad. Despite the testimony of certain New Jersey fishermen to this effect, a com-

parison of actual stream flow with reported shad catches shows the entire absence of any such relation (R. 3028-30; Ex. 349). Although stream flow in the Delaware River since 1900 has remained practically constant, subject to the usual seasonal variations, yet the 1900 shad catch was forty times greater than the 1921 catch (R. 3029-30). The marked decline in the Delaware River shad is a matter of general knowledge; and is commented upon by the United States Bureau of Fisheries in its 1927 report which contains a brief historical review of the fisheries of New Jersey, New York, Pennsylvania and Delaware from 1880 to 1926 (R. 3030-31; Ex. 350).

We submit that the New Jersey allegation that the New York diversion (Ex. 4) will injuriously affect agriculture and fishing is wholly unwarranted under the evidence in this case; and that these moribund occupations should never have been invoked by New Jersey, were it not for the appalling lack in its proofs of substantial damage.

5. *There will be no material injury to recreation.*

The Special Master found that the operation of the New York diversion (Ex. 4) will at times appreciably impair the use of the Delaware River for recreational purposes; and that any appreciable damage to the recreational use as well as the reputation of the Delaware River will be eliminated by decreasing the New York diversion, by using the Pennsylvania plan of release and by the treatment of sewage and industrial waste at Port Jervis (R. 4902). He

pointed out that in his opinion the reputation of the Delaware River as a place of recreation is important and should not be measurably impaired; and that the recreational public will be apt to ascribe to the New York diversion any unsatisfactory condition of the river (R. 4902). He added that in his opinion the New Jersey had over-estimated and the New York and Pennsylvania witnesses had under-estimated the effect of the operation of the New York diversion (Ex. 4) on the recreational uses of the Delaware River (R. 4900).

The Special Master therefore concluded that the effect of the New York diversion on the recreational uses of the Delaware River will be to cause somewhat more than slight damage, particularly as affecting the reputation of the river as a place of recreational resort (R. 4902). New York City and State alone have excepted to this finding and conclusion of the Special Master.

The Pennsylvania engineers in formulating their plan of impounding and release reached the conclusion that recreational use of the Delaware River would be improved by the release of compensation water during the critical period of low flows in vacation time (R. 3551, 3553, 3605-09). Despite the above finding of the Special Master, the Commonwealth of Pennsylvania still believes that the Pennsylvania proofs fully sustain its contention that there will be no substantial damage to recreation under the Pennsylvania plan of impounding and release; and that the recreational use of the Delaware River will

actually be improved through the release of compensation water during the vacation season.

However, the Commonwealth of Pennsylvania does not take issue with the Special Master in this regard for three reasons, namely: (1) the superimposition of the Pennsylvania plan of impounding and release upon the present New York taking gives the Intervenor the only protection that it seeks against the New York diversion insofar as recreation is concerned; (2) the further condition of the Special Master that Port Jervis sewage and industrial waste must be treated by New York is of substantial and immediate benefit not only to recreation but also to all Pennsylvania downstream interests; and (3) any future taking of water from the Pennsylvania tributaries of the upper Delaware River will be principally below the recreational area so that its effect upon recreation will in no wise be comparable to that of the present New York taking; and hence the finding of the Special Master regarding the effect of the New York diversion (Ex. 4) on recreation will be wholly inapplicable to any such future Pennsylvania taking for water supply purposes.

The basis for the New Jersey charge that the New York diversion will adversely affect the recreational use of the Delaware River is that the New York as well as the Pennsylvania plan of impounding and release will take away the summer rises, which are alleged to be of great benefit to recreation through their scouring out of the pollution that accumulates during periods of low flow. This ill founded con-

tention is closely akin to the other fallacious New Jersey argument that these summer rises greatly improve sanitary conditions of the river by washing away accumulated sludge deposits.

Mr. Weston is of the opinion that summer rises are detrimental from a sanitary standpoint in that they scour out and bring down sludge deposits and thereby increase the B. Coli at a most unfavorable time of the year (R. 3865-66). He further believes that the purgative high flows in cool weather will not be interfered with under the Pennsylvania plan of impounding and release; and that it is preferable to have sludge banks and other deposits of pollution remain where they form and be slowly digested by bacteria until a large volume of water comes along in cool weather to diffuse and wash them downstream (R. 3865, 3871-72, 3918-19, 3928).

Regardless of what is the correct sanitary view respecting summer rises, the sanitary experts of all parties are agreed that the best remedy for sludge deposits is sewage treatment and not summer rises nor cooler purgative floods. By reason of the several agreements for the sanitary conservation of the Delaware River (Exs. 425-26), the day should not be long distant when sludge deposits in that stream will be eliminated by the treatment of sewage and industrial waste.

The Special Master eliminated the chief source of sludge deposits in the recreational stretch of the Delaware River when he provided that the sewage and industrial waste of Port Jervis, which is located at

the head of the recreational area, must be treated. The elimination of this source of complaint practically destroys the basis for the New Jersey charge that the New York diversion (Ex. 4) will adversely affect the recreational use of the Delaware River.

The Pennsylvania theory regarding recreation is the same as that respecting sanitation. The critical period of the year for each is the period of low flows in warm weather; and to the end that conditions at that time may be improved, the Pennsylvania plan requires the impounding of high flows in cool weather so as to increase the low flows of the critical period by the release of compensation water. By thus augmenting the low flows of summer the Pennsylvania engineers are of the opinion that the Pennsylvania plan of impounding and release will not only protect but greatly benefit the recreational use of the river as well as its sanitary condition during vacation time, which corresponds with the summer months (R. 3551, 3553, 3605-09).

If Mr. Merriman is sound in his contention that the best river stage for recreational use is between 0.3 c.s.m. and 0.5 c.s.m. (R. 2628-30, 2708-09, 2755-60), then the stage control of 0.5 c.s.m. that governs the release of compensation water under the Pennsylvania plan is most advisable from the point of view of recreation.

The New Jersey proofs under recreation stress the fact that bathing in the Delaware River is not safe at Tri-State Rock due to the Port Jervis sewage discharge (R. 1455-57). This ground of complaint

has been removed from this case by the requirement that Port Jervis must treat its sewage and industrial waste. Moreover, although all the sanitary engineers agree that bathing in the Delaware River immediately below points of sewage discharge is dangerous and inadvisable (R. 1455-57, 2910, 3912), yet New Jersey could not produce any evidence to show the contraction of any diseases from bathing in the Delaware River at any point. Unfortunately, there is no generally accepted B. Coli standard for bathing; and the New York witness, Dr. Eddy, stated without contradiction that people can probably bathe even at Port Jervis in large numbers and not contract disease (R. 2934-35).

In conclusion, we submit that the Pennsylvania proofs fully justify the finding of the Special Master that the adoption of the Pennsylvania plan of impounding and release and the treatment of Port Jervis sewage and industrial waste will eliminate any appreciable damage to the recreational use as well as the reputation of the Delaware River. We further submit that by the release of compensation water under the Pennsylvania plan of impounding and release at times of low flow during the vacation season there will be a substantial benefit to the recreational use of the Delaware River.

6. *The effect upon the New Jersey oyster industry will be slight and immaterial.*

The Special Master found that the New York diversion (Ex. 4) will at times increase and accentuate

natural adverse variations in salinities and other conditions in Delaware Bay, except at those periods of very low flow when water is released from the impounding reservoirs; and that while the New York diversion will not have the very great damaging effect claimed by New Jersey, yet undoubtedly it will have the effect of producing more than slight damage and there will result a greater damaging effect that New Jersey should be called upon to bear under the principle of fair and equitable apportionment (R. 4934). He further found that by reducing the New York taking and by modifying the plan of releasing water at low river stages, the damage to New Jersey will be so decreased as to become slight and inconsequential (R. 4934).

New York City and State have alone excepted to this finding of more than slight challenge. New Jersey does not challenge the finding or the further statement by the Special Master that the New York diversion (Ex. 4) will not have the very great damaging effect claimed by that State (R. 4934).

In order to reach his findings on oysters, the Special Master relied upon the following salient facts, namely, that Delaware River oysters are now living and thriving in salinities and conditions of wide variations; that they have adjusted themselves to these varying salinities and conditions; that the execution of the New York diversion (Ex. 4) will not make a relatively great change in salinities and other conditions; and that there is no permanent pool of fresh water at the mouth of Delaware Bay to control salinity

conditions over the New Jersey oyster beds (R. 4923-24, 4933-34). These fact findings not only strike at the basis of the New Jersey contention of serious damage but also corroborate and epitomize the Pennsylvania proofs and contentions respecting oysters. It is, therefore, incomprehensible to the Intervenor how the Special Master can predicate his finding of more than slight damage upon these outstanding facts.

However, the Commonwealth of Pennsylvania has not questioned this seeming erroneous ruling of the Special Master because (1) it possesses no oyster beds and hence is only indirectly interested in the New Jersey contention that the New York diversion (Ex. 4) will increase salinity in Delaware Bay to such a degree that the oyster industry can no longer prosper but must succumb to its natural enemies and (2) the present as well as any future Pennsylvania taking of Delaware River water for domestic and municipal purposes is and will be but a temporary diversion and therefore cannot and will not appreciably affect salinity conditions in Delaware Bay. In this regard, it should be noted that the Special Master attached great importance to the fact that the New York diversion (Ex. 4) will be a permanent diversion from the watershed (R. 4934).

The fact is undisputed that oysters as a general rule can and do live in a wide range of salinity and can and do readily adjust themselves to salinities ranging from 2.6 to 32 parts per thousand (R. 1642-43, 2490-94, 3018-20, 3024-27, 3719-20, 4314-19). It is likewise undisputed that Delaware Bay oysters

also possess this power or trait of adaptability and have already adjusted themselves without any apparent damage to a far greater range in salinity than that prevailing over their natural habitat. Most convincing proof of this is the quadrupling in area of the original, natural oyster beds through the compulsory throwing back of oyster shells pursuant to the Rough Cull Act of 1898 (R. 1785, 1788-90, 1793, 1849-50) and the man-made planting grounds for seed oysters of approximately 31,436 acres (R. 1886, 3699-3700, 3715-16, 3719-20).

Mr. Morgan testified that the New York diversion (Ex. 4) will vary the salinity of Delaware Bay from a quarter of one part per thousand up to possibly one and a half parts per thousand (R. 3696-97). This will be far less than the seasonal variation in salinity due to the normal changes in flow of the Delaware River as indicated by the daily flow diagrams (R. 3694-97). It is also far less than the salinity range or variation of at least 15 parts per thousand, to which Delaware Bay oysters have had to accommodate themselves by reason of the extension of the natural beds and the artificial creation of the planting grounds (R. 3715-16).

That present salinity conditions in Delaware Bay are adverse to the oysters can not be gainsaid. The proofs of all parties disclose that the present salinity lines of the natural and seed oyster beds are not only far above the death line of 12.5 parts per thousand for oyster drills but are actually high enough to permit that natural enemy to live in these beds

throughout the entire year (R. 2482-87, 3017, 3714, 4330-38; Exs. 300 E & F). In view of the fact that the drills are already at home over the beds and in view of the further fact that the salinity range is nowhere ever low enough to kill them, the slight increase from the New York diversion (*i. e.*, a maximum of one and a half parts per thousand) is obviously of no consequence (R. 3714).

In rebuttal of the New Jersey contention that the New York diversion will seriously deplete the offshore pool or basin of low salinity water that is responsible for maintaining favorable salinity conditions over its oyster beds (R. 1692-1712, 1755-62), New York City called as a witness Mr. Harry A. Marmer, Chief of the Section of Field Work of the Division of Tides and Currents of the United States Coast and Geodetic Survey and in active charge of the 1924 tide and current survey of the Delaware Bay for the Federal Government (R. 2987-88).

His official 1924 current and tidal observations prove very definitely that the fresh water coming into the Bay from the Delaware River tends to concentrate along the Delaware shore rather than spreading out uniformly over the Bay; and that about 5 times as much fresh water passes out the channel next to the Delaware shore as passes out the channel along the New Jersey shore (R. 2989-90). This means that the fresh water concentrated along the Delaware shore cannot be brought back towards the New Jersey shore on the flood tide (R. 2989-90).

The witness stated that the fresh water flowing out

of Delaware Bay does not remain as a pool of relatively fresh water near the mouth of the Bay, because observations indicate the existence of a southerly current with a velocity of about 2 miles per day which carries the fresh water away from the mouth of Delaware Bay and its place is taken by ocean water from the north (R. 2990-91). Besides, the current or tide turns to flood about one and a half hours earlier along the Jersey shore than the Delaware shore; and this means that even after the current or tide has started flooding in towards the Jersey shore, the current is still in the main channel and carrying the fresh water of the Delaware River into the bay (R. 2990-91).

A comparison of the fresh water discharge of the Delaware River with the volume of diurnal tidal waters of Delaware Bay will demonstrate the relative importance of these two agencies in determining salinity conditions. Mr. Marmer stated that the average daily fresh water discharge into Delaware Bay is approximately 2 billion cubic feet, whereas the flood tide each day carries in from the sea 178 billion cubic feet of water and takes out 180 billion cubic feet of water on the average (R. 2989-90).

Thus, on the average, the tide daily brings into Delaware Bay 89 times as much water as the fresh water drainage (R. 2989). Such being the fact, it is manifest that the controlling factor in maintaining salinity conditions in the bay is the tide and not the Delaware River. The official inspection trip likewise afforded persuasive ocular proof of how vast a body

of water is Delaware Bay and how relatively insignificant is the fresh water discharge of the river into it.

Seeing that New Jersey did not produce any tidal experts or their field surveys to contradict the testimony of Mr. Marmer, it is not surprising that the Special Master rejected the New Jersey contention that there is a permanent pool of fresh water at the mouth of Delaware Bay which controls salinity conditions over the oyster beds; and also dismissed the obviously exaggerated testimony of Dr. Nelson with the euphemistic comment that in his interest and zeal for his profession, Dr. Nelson had unconsciously over-estimated the effect of the New York taking (R. 4923-24).

A striking omission in the New Jersey proofs is the failure to show that high salinities and the presence of the natural enemies of the oyster are always inseparable and interdependent. The New York proofs disclose that there is no direct relation between them and that the presence of these natural enemies depend upon a combination of factors, of which high salinity is neither the only nor the controlling one (R. 3020-21, 3027-28). In addition, it is undisputed that oysters can and do live and thrive in the midst of their natural enemies (R. 3020-21, 3027-28).

Having signally failed to show that the New York taking will materially increase saline conditions in Delaware Bay and that the drills and other natural enemies will consequently appear and destroy the oyster industry, the New Jersey proofs in rebuttal

turned in despair to the contention that any regulation in the flow of the Delaware River will be harmful to the oyster industry (R. 4359-60). This unsound contention is predicated upon an alleged delicate and discriminating adjustment between fresh and salt water in Delaware Bay, which nature has established through the ages and under which the New Jersey oyster has developed through the law of natural selection (R. 4359-60). But this contention completely forgets that any such adjustment has already been upset by man in recent times through the extension of the natural beds and the creation of the artificial beds; and is contrary to what experience has shown concerning the regulation of stream flow under the Wallenpaupack power project, which has been in daily operation since 1928 without injurious effect upon the oyster industry (R. 4383-84). We have previously shown the similarity between the daily releases from this power project and from the New York reservoirs under the Pennsylvania plan of impounding and release (pp. 42, *supra*).

In conclusion, we submit that the Special Master correctly observed that Delaware Bay oysters are now living and thriving in salinities and conditions of wide variations to which they have adjusted themselves, and that the operation of the New York diversion (Ex. 4) will not make a relatively great change in salinities and other conditions (R. 4933-34). We further submit that the Special Master correctly found that under the Pennsylvania plan of impounding and release the damage to the New Jersey oyster industry will be slight and inconsequential (R. 4934).

7. *The New Jersey power project must rest in abeyance and is not material to this cause.*

The Special Master found that on the showing made in this case there is no basis for injunctive relief on the ground that the proposed New York diversion (Ex. 4) will interfere with the development by New Jersey or her citizens of water power on the Delaware River (R. 4858). He based this denial of injunctive relief upon the grounds that (1) there is no definite or authorized project for damming the Delaware River to create water power and hence any alleged damage thereto is not immediate and proximate but is too remote, (2) such a power project requires the consent of Congress as well as of Pennsylvania and New York and the proofs show that no application has been made for such consent and that such consent could not be obtained from Pennsylvania and New York, and (3) the proofs in the present case do not disclose that the proposed New Jersey development of water power in the Delaware River is sound economically or attractive financially (R. 4964-65).

New Jersey has excepted to the findings of the Special Master on water power insofar as he finds that the New Jersey proofs do not establish the feasibility of Delaware River power development and insofar as he finds that power development is latent and cannot therefore afford any basis for injunctive relief. No attempt is made in the New Jersey brief to answer the main reasons why their power proofs were irrelevant and immaterial. Of

course, neither New York City and State nor Pennsylvania have filed any exceptions to the rejection by the Special Master of the New Jersey proofs regarding any alleged material damage to future power development in the Delaware River.

The Commonwealth of Pennsylvania has throughout the present proceedings maintained that the New Jersey proofs sur power development were irrelevant and immaterial because they were too remote and speculative and also because power development in the Delaware River was not only expressly prohibited by the Anti-Dam Treaty of 1789 but was also contrary to the avowed policy of Pennsylvania against any such power development. But apart from these valid legal objections to the New Jersey power project, the Commonwealth of Pennsylvania is resolutely opposed to power development in the Delaware River because it is necessarily incompatible with and destructive of the use of the Pennsylvania tributaries of the upper Delaware River as a source of water supply for Philadelphia and Eastern Pennsylvania.

Prominent among the many reasons and advantages that will eventually compel Philadelphia and Eastern Pennsylvania to go to the Pennsylvania tributaries of the upper Delaware River for their future source of water supply are (1) a purer and better quality of water, and (2) a gravity feed (pp. 168-169, *infra*). Both of these reasons and advantages are necessarily antagonistic to power development in the Delaware River.

Mr. Ryder declared that the New Jersey power project will adversely affect the quality of the water by substituting river water for pure upland water and will materially interfere with a gravity feed through the loss of head for power purposes (R. 3610). Mr. Morgan entirely corroborated this declaration with the statement that power on the tributaries can only be secured by dropping the water to a lower level, which will greatly interfere with the possibility of a gravity supply (R. 3265, 3693); and that the water taken for power will in all probability drop into the Delaware River or so near to it that it will be further contaminated (R. 3693).

But power and water supply in the Delaware River must unavoidably conflict in another leading aspect, namely: over the amount of water available for each purpose. Power will take all water available; and if vested power rights are thereby conferred or accrue, the quantity of water left for water supply may prove too little. On the other hand, if power rights are to cease at a given future date, this lack of permanency will make the project less attractive to investors. Both Mr. Ryder and Mr. Morgan testified regarding this further inevitable conflict between power and water supply; and stated that the two can not mix or go hand in hand on the Delaware River (R. 3610-11, 3692-93).

This Pennsylvania testimony is uncontradicted and explains why the Pennsylvania engineers in formulating their plan of impounding and release excluded power from the many Pennsylvania interests

in the waters of the Delaware River (R. 3551-58, 3606-10, 3617-25). There was, however, a further cogent reason for such exclusion, namely that the Attorney General of Pennsylvania advised his engineers as a matter of law that power development in the Delaware River must rest in abeyance until the repeal of the Anti-Dam Treaty of 1789 and the revocation of Pennsylvania's present policy against such power development.

The Anti-Dam Treaty of April 26, 1789, P. L. 77, provides, *inter alia,* that the Delaware River "is and shall continue to be and remain a common highway equally free and open for the use, benefit and advantage of the said contracting parties." The Special Master construed this Treaty as forbidding either State to build a dam across the Delaware River and thereby obstruct navigation without the consent of the other State; was of the opinion that this compact is still in force and effect; and therefore concluded that neither New Jersey nor Pennsylvania can lawfully, without the consent of the other, authorize any person or corporation to construct a dam across the Delaware River between New Jersey and Pennsylvania (R. 4854-56).

This interpretation by the Special Master of the Anti-Dam Treaty of 1789 accords with a recent ruling by the Attorney General of Pennsylvania. The laws of the Commonwealth in 1911 required the State Water Supply Commission to pass upon and approve of all power dams. Pursuant to these laws, an application was filed with said Commission by the

Delaware River Improvement Company, a New Jersey corporation, for leave to construct a power dam across the Delaware River at Belvidere, New Jersey. The Commission in turn sought the advice of the Attorney General of Pennsylvania upon its jurisdiction to entertain such an application.

The Attorney General, John C. Bell, Esq., in an opinion dated July 26, 1911, and reported at pages 346-50 in the printed opinions of the Attorney General for that year, carefully reviewed the history of the Anti-Dam Treaty of 1789 and concluded that because its provisions prevented the erection of power dams in the Delaware River, the State Water Supply Commission lacked jurisdiction and could not grant permission to construct the proposed plant. The application was accordingly denied.

This ruling of the Attorney General of Pennsylvania is still in force, and therefore controls the present attitude and action of the Commonwealth respecting power development in the Delaware River.

The Special Master also concluded that apart from the Anti-Dam Treaty of 1789 the consent of Pennsylvania is needed for the construction of any power dam across the Delaware River (R. 4854-55). This conclusion is in accord with the decisions of this Court that despite the United States Constitution and legislation enacted thereunder a State still retains jurisdiction over the erection of obstructions upon state property in and about navigable waters. Whenever power development means an obstruction of navigable waters by the erection of dams on state property (and

the New Jersey power project calls for the erection of many dams on Pennsylvania property), then the consent of the State as well as of the Federal Government are conditions precedent to such power development.

International Bridge Co. v. New York, 254 U. S. 126 (1920).

This was a suit brought by the State of New York to recover penalties from the Bridge Company for failure to place, as required by state statute, a roadway for vehicles and a pathway for pedestrains upon a bridge between the New York mainland and Squaw Island in Niagara River. The Bridge Company defended upon the ground that this was an international bridge between New York State and Canada, that the bridge was devoted wholly to international commerce and had been authorized by an Act of Congress, and that Congress had thus assumed such control over the bridge as to exclude any intermeddling by New York State. The proofs showed that the part of the bridge, with which the case is concerned, lay within the territory of New York State and that the United States had not exercised its power of eminent domain over that portion of the bridge.

This Court held that the State of New York was to be considered as the source not only of the title to the land upon which the bridge was erected, but also of the right to erect and use a bridge upon it; and that the action of Congress relative to navigable waters not wholly within the territory of a State

did not destroy the previously existing authority of the State over any portion of its territory situate within the navigable waters.

The following quotation is from the opinion of Mr. Justice Holmes:

> (p. 133) "But it is said that a different rule applies to an international stream and that Congress has recognized the distinction by the Act of March 3, 1899, c. 425, sec. 9, 30 Stat. 1151. It is true that that statute makes a distinction, but the distinction is that bridges may be built across navigable waters wholly within the State if approved by the Chief of Engineers and the Secretary of War, but, with regard to waters not wholly within the State, only after the consent of Congress has been obtained. **The act does not make Congress the source of the right to build but assumes that the right comes from another source, that is, the State. It merely subjects the right supposed to have been obtained from there to the further condition of getting from Congress consent to action upon the grant.**"

The **International Bridge Company case** *(supra)*, primarily involves the construction of sections 9 and 10 of the Act of March 3, 1899 (U. S. C. A. tit. 33, secs. 401, 403), which sections regulate the erection of dams and other obstructions in navigable waters of the United States. The significance of that decision, insofar as the present case is concerned, lies in the express holding by this Court that the concurrent jurisdiction of a State over the erection of dams and other obstructions on state property in

navigable waters survives the Constitution and any legislation enacted thereunder. If the Commonwealth of Pennsylvania still retains jurisdiction over that portion of its territory lying under its one-half of the Delaware River, then the exercise of that jurisdiction through the passage of the Anti-Dam Treaty must and will be recogngized by this Court.

The States of New Jersey and Pennsylvania, as well as the United States, have always recognized the jurisdiction of the Commonwealth to the midstream of the Delaware River. Insofar as the New Jersey power project relates to the erection of dams on tributaries lying wholly within the Commonwealth of Pennsylvania, obviously the consent of Pennsylvania is necessary unless its property has been previously condemned by the Federal Government, and the power development is national and not state. Insofar as the New Jersey power project contemplates the construction of power dams in the main channel of the Delaware River, where it constitutes the boundary between Pennsylvania and a sister State, the consent of Pennsylvania must be previously obtained to that portion of the dam that is erected on the Pennsylvania side of the river in the absence of eminent domain by the United States.

The concurrent jurisdiction of a State over intrastate navigable waters has been repeatedly upheld by this Court. The following federal cases have recognized this concurrent jurisdiction, namely: **Lake Shore and Michigan Railway v. Ohio, 165 U. S. 365 (1897); Cummings v. Chicago, 188 U. S. 410 (1903).**

The Water Power Act of June 10, 1920 (U. S. C. A. tit. 16, sec. 791), has in no wise affected this concurrent power of a State over interstate navigable waters. There is no decision by this Court in point but the Supreme Court of Illinois fully discussed the extent of this power, despite the Water Power Act, in the case of **Department Public Works v. Engel, 315 Ill. 577 (1925).** The opinion discusses the effect of this Act upon the concurrent jurisdiction of a state, as follows:

> (p. 584) "The effect of this legislation (Water Power Act) is to make the erection of any structure in a navigable river within the State depend upon the assent of both the federal and state governments (Cummings *v.* City of Chicago, 188 U. S. 410, 23 Sup. Ct. 472)."

In the light of the foregoing cases we submit that the Anti-Dam Treaty of 1789 survived the adoption of the United States Constitution and that the Commonwealth of Pennsylvania may invoke its provisions to restrain the erection of power dams upon its territory under the navigable waters of the Delaware River, until the said Treaty has been mutually repealed by New Jersey and Pennsylvania. We further submit that the consent of Pennsylvania is a condition precedent to the construction of any such power dams; and that consent cannot be obtained until the Commonwealth revokes its present policy against power development in the Delaware River.

A further unanswerable legal objection has been interposed by the Special Master to the New Jersey

power project and the relevancy of proofs in that regard, to wit: the lack of any prior consent of the Federal Government to the erection of the necessary power dams in these navigable waters of the United States (R. 4964-65). Under sections 9 and 10 of the Act of March 3, 1899, any power development in the Delaware River must rest in abeyance until the required Federal consent has first been procured.

The Special Master held that any alleged damage to power development in the Delaware River was immaterial and irrelevant because there was no definite or authorized project for the same and hence the injury would be too remote to justify injunctive relief (R. 4857-58). This holding of the Special Master is in accord with the well established rule of this Court that in order to obtain injunctive relief the alleged damages must be presently suffered or threatened. Power development in the Delaware River lies wholly in the future and any potential damage to it is too remote and distant to be presently actionable.

The inadmissibility and immateriality of such future damages was unequivocally held by this Court in the recent case of

New York v. Illinois, 274 U. S. 488 (1927).

This was a bill in equity to enjoin a very substantial diversion of water from Lake Michigan. The third paragraph of the bill averred that the diversion might interfere with or prevent the use of the waters of the Niagara or St. Lawrence Rivers for the future

development of power. A motion to strike out this paragraph was filed.

In granting the motion to strike out, Mr. Justice Van Devanter said:

> (pp. 489-90) "The third paragraph of the bill apparently proceeds on the theory that the diversion may interfere with or prevent the use of the waters of the Niagara and St. Lawrence Rivers by the plaintiff State and her citizens for the development of power. **But it does not show that there is any present use of the waters for such purposes which is being or will be disturbed; nor that there is any definite project for so using them which is being or will be affected.** The waters are international and their use for developing power may require the assent of the Dominion of Canada and the United States. No consent of either is shown. **The suit is one for an injunction, a form of relief which must rest on an actual or presently threatened interference with the rights of another. Plainly no basis for such relief is disclosed in what is said about water power development. At best the paragraph does no more than present abstract questions respecting the right of the plaintiff State and her citizens to use the waters for such purposes in the indefinite future.** We are not at liberty to consider abstract questions. New Jersey *v.* Sargent, 269 U. S. 328. So the motion to strike out the paragraph must be sustained. This ruling will be without prejudice, so that the plaintiff State, if later on in a position to do so, may be free to litigate the questions which the paragraph is intended to present."

We submit, therefore, that the New Jersey proofs respecting potential power development in the Delaware River and any alleged damage thereto are wholly inadmissible and irrelevant because of (1) the Anti-Dam Treaty of 1789, (2) the refusal of the consent of Pennsylvania to the erection of power dams in the Delaware River, (3) the lack of the prior consent of the Federal Government, and (4) any potential injury to power is too remote to sustain the granting of an injunction. Because of this inadmissibility and irrelevancy of the New Jersey power proofs, counsel for the Commonwealth of Pennsylvania deem it unnecessary to answer the New Jersey proofs and arguments in support of the contention that their power project is financially feasible.

We further submit that the New Jersey power project is incompatible with a water supply for Philadelphia and Eastern Pennsylvania from the Pennsylvania tributaries of the upper Delaware River and must consequently succumb to the higher use of that water for domestic and municipal potation. This is in accordance with the decision by Mr. Justice Butler in the most recent case of **Connecticut v. Massachusetts** *(supra)*, to the effect that "drinking and other domestic purposes are the highest uses of water" and that "an ample supply of wholesome water is essential." As was said by this Court in the case of **Columbus v. Mercantile Trust and D. Co., 218 U. S. 645 (1910),** at page 658 of the opinion by Justice Lurton, "no higher public duty rests upon municipal authorities than that of furnishing an ample supply of pure wholesome water for public and domestic purposes."

8. *Navigation on the Delaware River lies exclusively within the jurisdiction of the War Department and will not in fact be adversely affected.*

The Special Master found that there is no basis for injunctive relief on the part of New Jersey on the ground that the carrying out of the New York plan will obstruct navigation or impair the navigable capacity of the Delaware River (R. 4847-48). In reaching this conclusion, he relied upon the clear, precise, forceful and convincing testimony of General George B. Pillsbury, Assistant Chief of Engineers of United States Army and for several years in charge of the Delaware River while located as district engineer at Philadelphia (R. 4844).

New Jersey excepted to this finding of the Special Master and assigned in support of the exception the alleged reasons that the proposed New York diversion will substantially affect navigation in and navigable capacity of the Delaware River and its tributaries and also that New York City has not complied with the provisions of the River and Harbor Act of March 3, 1899.

The Commonwealth of Pennsylvania submitted no proofs in answer to the New Jersey charge that navigation upon the Delaware River and its navigable capacity will be materially injured under the New York diversion (Ex. 4). Believing that this alleged injury lay within the exclusive jurisdiction of the War Department, and knowing that the Special Master in the exercise of his unquestioned power intended to summon General Pillsbury as his witness

in this case, counsel for Pennsylvania were content to entrust the entire question of navigation to the War Department and General Pillsbury.

Accordingly we shall first discuss the statutes and decision law that sustains the exclusive jurisdiction of the War Department over navigation; and thereafter briefly consider the testimony of General Pillsbury, which shows that there will be in fact no damage to navigation under the Pennsylvania plan under all conditions of taking, and also that the Pennsylvania plan is slightly better than the New York plan insofar as navigation is concerned.

The navigable character of the Delaware River is conceded by all parties. The evidence in this case shows that the first steps taken in aid of Delaware River navigation were legislative enactments by New Jersey, New York and Pennsylvania, establishing and improving its navigability (R. 745-51; Exs. 117-125). In more recent years the Federal Government has borne the burden of improving Delaware River navigation by numerous channel appropriations that now call for a project depth of 35 feet to Philadelphi and 20 feet to Trenton (R. 857-74, 1061-68, 1108-29, 3644, 3954).

To date, the War Department has exercised jurisdiction over the lower and upper Delaware River up to and including the east and west branches (R. 3658-59). The exercise of this jurisdiction is evidenced not only by supervision of channel improvements but also by the authorization of bridges

that do not impede navigation (R. 1409-10, 2982-3032, 3658-60, 3953).

It is fundamental that the foregoing action of the Federal Government respecting navigation on the Delaware River precludes the boundary States from taking any future action regarding such navigation. The jurisdiction of the State in this regard exists only until the United States assumes to act; and thereafter Federal action excludes further state action respecting navigation.

Sections 9 and 10 of the Act of March 3, 1899 (U. S. C. A. tit. 33, secs. 401, 403), delegate to the War Department the jurisdiction over the construction of dams and like structures in navigable waters of the United States. The Special Master found that section 9 was not applicable because the New York tributaries of the upper Delaware River are non-navigable waters; but held that section 10 applied because the New York impounding reservoirs might affect the navigable capacity of the Delaware River (R. 4840-41). He then pointed out that the United States was not a party to this suit and could in no way be bound by any decree of this Court regarding navigation; and that New York City must assume the risk of any action which Congress or the War Department may see fit to take under their paramount authority over navigation regarding the present New York taking of 440 m.g.d. (R. 4847-48).

It thus appears that the power and duty of determining whether a diversion of water from a navigable stream will obstruct navigation or the navigable ca-

pacity of that stream rests solely with the Secretary of War and his Chief of Engineers under sections 9 and 10 of the Act of March 3, 1899. It further appears from the evidence in this case, that the local representative of the War Department, General Pillsbury, in the discharge of his official duties, reported to the Department that in his opinion the War Department was not justified in intervening in the present case because of any adverse effect of the diversion on Delaware River navigation (R. 3644-46).

Before stating his findings and recommendations, General Pillsbury testified that in September, 1929, he received from the Board of Water Supply of New York City a letter (Ex. 351) informing the War Department of the New York plan (Ex. 4), for the development of a new and additional water supply from drainage areas in the head-waters of the Delaware River (R. 3644); that the existence of such a plan had been known and generally considered in connection with the departmental survey of the Delaware River under the River and Harbor Act of January 21, 1927 (R. 3644); and that upon the receipt of this letter from the Board of Water Supply careful and detailed computations were made to determine the effect of the diversion and release under the New York plan (Ex. 4) on the navigation and navigable capacity of the Delaware River (R. 3644-45).

General Pillsbury further testified that the tidal range at Trenton varies from nearly 6 feet at the time of minimum discharge of the river to nothing when the discharge of the Delaware River has

reached the vicinity of 90,000 c.f.s.; and that navigation is interested ordinarily and primarily in the depth at low water at low tide, although a very important navigation is frequently carried on in the depth at high tide (R. 3644-45).

The departmental investigations made under the directions of General Pillsbury brought out the following findings as to the effect of the New York diversion on the water levels at the head of the 12 foot channel at Trenton: (1) that for a very small percentage of the time and at lowest river discharge and lowest river levels, the diversion will in the long run increase the low water heights by about one-tenth of a foot due to the release provided in the plan (R. 3644-45); (2) that during ordinary low water levels of less than one foot above the minimum level, which levels occur during about 40 per cent. of the time, the diversion will decrease the low tide level by from one-tenth to fifteen-hundredths of a foot, and the high levels by much less than one-tenth of a foot (R. 3645); (3) that at higher discharges, when the low level is from one to seven feet above minimum low water, the diversion may increase the elevation at low tide by as much as half a foot, and at high tide by as much as two-tenths of a foot (R. 3645); and (4) that when the river discharge without the New York diversion is such as to give 21 feet in the channel at low tide, the depth with the diversion will be 20.85 feet, and when the river discharge is such as to give without diversion 22 feet in the channel at low tide, the depth with the diversion will be in the long run 21.75 feet (R. 3645-46).

From these findings, General Pillsbury and his associate engineers reached the conclusion that insofar as navigation at and below Trenton is concerned, the effect of the New York diversion will be practically nothing when the river level is on the project plane of mean low water (R. 3645); and that the effect of the diversion will be decreasingly less at successive points downstream from Trenton (R. 3646). General Pillsbury observed that the small differences in channel depth at low tide under the New York plan are far below the accuracy obtainable in dredging and surveying the channel and are far beyond the practical utilization of the channel for navigation (R. 3646).

General Pillsbury is of the opinion that the diminution of about five-tenths of a foot at high stages of the river will not adversely affect navigation because these high stages occur for but brief periods of time and vessels will be loaded under present conditions of navigation to meet river conditions that they can assuredly count on (R. 3646).

The foregoing findings and conclusions led General Pillsbury to report to the War Department that in his opinion the Department was not justified in intervening in the present case at the present time on account of the effect of the diversion on navigation (R. 3646).

So far as navigation below Trenton is concerned, General Pillsbury stated that the taking of 600 m.g.d. under the New York plan of impounding and release will in no wise adversely affect navigation (R. 3645-

46); and that such a taking under the Pennsylvania plan will likewise have no adverse effect on navigation (R. 3648). The slight increase in the extreme low water flows under the Pennsylvania plan, as shown by the diagrams, is so small that it will raise the low tide level by something on the order of half an inch, and the high tide level even less; and this benefit to navigation is in his opinion entirely immaterial (R. 3648-49).

It is his decided opinion that when all three States are in the future taking 1750 m.g.d. from the Delaware River under the Pennsylvania plan of impounding and release, there still will be no adverse effect on navigation, although General Pillsbury has no detailed computations to establish the effect on navigation under those conditions (R. 3648-49, 3651).

New Jersey brought out by its cross examination of General Pillsbury that he was speaking about the effect not only on present day navigation but also on future navigation to the extent that it can be foreseen; and that the effect of any diversion will be less on the 20 foot project channel than on the existing 12 foot channel (R. 3652-53).

Upon cross examination by Pennsylvania, General Pillsbury stated that when all three States are taking their quota of water from the tributaries of the upper Delaware River the Pennsylvania plan of impounding and release is preferable to the New York plan (R. 3660).

The Special Master questioned General Pillsbury about the effect of the New York plan (Ex. 4) upon

the non-tidal upper Delaware River (R. 3646). The witness pointed out that the Delaware River above Trenton carries practically no navigation at the present time (R. 3646). This statement corroborates the extensive New Jersey proofs that many years ago Durham boats, steamboats and log rafts were to be found in the upper Delaware River but that this limited navigation had long since ceased and passed away (R. 751-852, 954-82, 1073-1104).

General Pillsbury stated that in order to render the Delaware River above Trenton navigable and useful for navigation under present conditions it will require the construction of locks and dams to provide a slack water navigation (R. 3647). The slope of the upper Delaware River is so steep that a useful channel for present navigation cannot be secured by dredging and rock excavation alone (R. 3647).

The amount of water required for the operation of such locks and dams is so small that the flow remaining in the Delaware River after the New York diversion will be much more than ample for the purpose (R. 3647). Consequently, General Pillsbury is of the opinion that the New York diversion will not interfere in any manner with any future improvement of the Delaware River above Trenton that Congress may make (R. 3647).

Upon cross examination by Pennsylvania, General Pillsbury further stated that when all three States are taking water and making releases in accordance with the Pennsylvania plan, there will be sufficient

water in the Delaware River above Trenton to permit of slack water navigation (R. 3660-61).

No attempt was made by New Jersey to rebut the statement of General Pillsbury that neither plan under all conditions of taking will harm any future slack water navigation upon the upper Delaware River above Trenton. Nor was any attempt made by New Jersey to contradict the testimony of Mr. Arthur E. Morgan as well as the New York witnesses, Messrs. Kutz and Finch, that there will be ample water for slack water navigation after New York takes its 600 m.g.d. under the New York plan (R. 2479-80, 2975, 3267). In this regard it is interesting to note that about 70 c.f.s. is ample water for a single lock waterway and about 105 c.f.s. for a twin lock waterway (R. 2479-80).

A strenuous effort was made by New Jersey at the rebuttal hearings to break down that part of the testimony of General Pillsbury in which he stated that navigation on the tidal prism of the lower Delaware River below Trenton will not be adversely affected under either plan and under all conditions of taking.

The first witness, Mr. Horton, produced Exhibits 300 "N" and "O" to prove that General Pillsbury is inaccurate in his statement that the New York diversion will diminish high stages of the Delaware River by as much as 6 inches (R. 4418). Exhibit 300 "N" purports to show the effect on low tide between June and November, when New York alone is taking under the New York plan (R. 4418-23);

and Exhibit 300 "O" purports to show the effect on low tide for the same months, when New York and Pennsylvania are taking under the Pennsylvania plan (R. 4423-27).

These two exhibits disclose that the low tide stage at the head of navigation at Trenton will be reduced more than 6 inches during especially high flows, when water is being taken by New York City under the New York plan, and by New York City and Pennsylvania under the Pennsylvania plan (Exs. 300 "N" and "O"). The exhibits do not show and the witness cannot state what is the relation during these unusually high flows between the channel depth of 12 feet and the actual navigable depth before and after the diversion (R. 4465-66).

The reason for this startling omission in the two exhibits is obvious and not hard to find. In attacking the "6 inch diminution" statement of General Pillsbury, counsel for New Jersey, as well as the witness, Mr. Horton, carefully refrain from mentioning the qualifying phrase that accompanied General Pillsbury's statement, namely "at higher discharges, when the low level is from 1 to 7 feet above minimum low water." They likewise carefully refrain from showing how much the river stage is increased above the minimum low water by these high flows, many of which are in excess of 100,000 c.f.s. (Ex. 300 "N" and "O"). We venture to suggest, without fear of contradiction, that the low level at these higher discharges was at least 1 to 7 feet above minimum low water; and that the actual navigable depth, after the diversion (which

the New Jersey witness and his exhibits dare not compute) is always greater than the channel depth of 12 feet.

The other New Jersey witness, Mr. Sabin, believes that the testimony of General Pillsbury is by and large correct and in accordance with the testimony in the present case; but then interposes the amazing suggestion that the unequivocal declaration by General Pillsbury that the diversion will not adversely affect navigation on the Delaware River is correct, if and only if properly interpreted (R. 4492-93). Entirely oblivious of the fact that the New Jersey proofs through the present case have on every occasion carefully eschewed daily computations and selected averages only, he takes unto himself the privilege of saying that General Pillsbury is talking of averages and that his statements are true as a matter of averages but are untrue if taken in detailed results (R. 4493-94).

It has been the experience of the Pennsylvania engineers that General Pillsbury and his army engineers are accurate in their computations and are not misled by averages. The only comparison of figures between the Pennsylvania and the Army engineers relates to the time of transit and it is uncontradicted that their two sets of figures are in substantial accord (R. 3522, 3581-82, 3611, 3723-24).

Counsel for Pennsylvania can under no circumstance believe that the Assistant Engineer in Chief of the United States Army does not mean what he says; and that his statements require gratuitous inter-

pretation. There is no ambiguity about the testimony of General Pillsbury; and if his words are given their ordinary and commonly accepted meaning, it is more than evident that no damage to navigation or the navigable capacity of the Delaware River will result from any taking under the Pennsylvania plan.

Before leaving the question of navigation, we desire to call attention to the testimony of General Pillsbury that a regulated flow of 1 c.s.m. in the Delaware River at Trenton, which is equivalent to 6800 c.f.s., will benefit navigation and the navigable capacity of the Delaware River; but that the amount of benefit will be very small in comparison with the cost of such regulation (R. 3654-55).

In conclusion, we submit that the Special Master was correct in finding that the carrying out of the New York diversion (Ex. 4) will not obstruct navigation or impair the navigable capacity of the Delaware River (R. 4847-48). We also submit that the Pennsylvania proofs as well as the testimony of General Pillsbury substantiate the Pennsylvania contention that their plan of impounding and release will slightly improve existing navigation on the lower Delaware River and will provide sufficient water for any future slack water navigation above Trenton, New Jersey. The Pennsylvania plan of impounding and release is likewise the best plan insofar as benefit to navigation and navigable capacity in the Delaware River is concerned.

E. The Special Master committed no error in recommending that this Court retain jurisdiction of the present cause.

The Special Master recommended that the present cause be retained in court for proper applications by any party hereto relative to matters left open to change or modification and relative to those features as to which there has been a decision without prejudice (R. 4969, 4972). New York City and State have alone excepted to this recommendation of the Special Master and request this Court to enter a decree finally determining the present cause.

The Commonwealth of Pennsylvania is vitally interested in a retention of jurisdiction by this Court because it desires (1) to renew its application for the appointment of a River Master as soon as New York commences its actual taking of water from the New York tributaries of the upper Delaware River, (2) to renew its application for an allocation of Pennsylvania's fair and equitable share in the waters of the Delaware River and its tributaries as soon as Philadelphia and Eastern Pennsylvania have adopted a definite project to take water from the Pennsylvania tributaries of the upper Delaware River, and (3) to submit proof of any damage shown by the two year salinity survey and to ask appropriate relief therefrom at the hands of this Court.

The Special Master thought it advisable to retain jurisdiction in order to test out the Pennsylvania plan of impounding and release during the operation of the

first development or stage of the New York taking (R. 4956). The Pennsylvania engineers believe that they have formulated a plan of impounding and release that is final and will not require revision; but are confident that the subjection of their plan to the acid test of practical operation, as recommended by the Special Master, will not only establish the finality of their plan but will also demonstrate its superiority under all conditions of taking.

1. *The advisability of appointing a River Master to regulate and control the taking of water from the Delaware River and its tributaries.*

The Special Master dismissed without prejudice the present application of Pennsylvania that a Delaware River Master be appointed by this Court in order that the Pennsylvania plan of impounding and release may be more effectively operated. He found that this proposition was beyond the scope of relief asked in Pennsylvania's pleading and was also premature (R. 4951-52).

Insofar as such an application is beyond the scope of Pennsylvania's pleading, that technical objection can and will be cured by the filing of the requisite pleading at the appropriate time in the future. Insofar as this application is premature, the Commonwealth will wait until New York City actually is ready to take Delaware River water and thus remove this other objection raised by the Special Master.

Before demonstrating the advisability and necessity for the appointment of a River Master, the

Commonwealth of Pennsylvania wishes to correct a misapprehension that the Special Master seems to entertain regarding this appointment. He stated that he had no reason to doubt that New York City and State will faithfully observe the terms of the decree by this Court specifying the conditions under which water may be taken from the tributaries of the Delaware River (R. 4952).

The natural inference from this observation of the Special Master is that the Commonwealth of Pennsylvania predicates its application for the appointment of a River Master upon a lack of confidence in the integrity and honesty of New York City and State. We emphatically deny any such lack of confidence on our part; and we confidently expect and believe that New York City and State will show the same high degree of honor and fair dealing that has marked their conduct of the present proceedings, when they are called upon to carry out the decree of this Court. Our application for the appointment of a River Master is based solely on the contention that such an appointment is necessary to carry out more effectively the decree of this Court in regard to the division and use of the waters of the Delaware River and its tributaries.

The necessity as well as the manifold advantages to be gained through the appointment of a River Master can best be illustrated by considering the more important functions and duties that he will be called upon to perform. They include (1) the forecasting of releases, (2) the measurement of stream

flow, (3) the use of surplus waters, and (4) the relief of emergencies.

Both Mr. Ryder and Mr. Morgan are of the opinion that accurate forecasting of river conditions will effect a substantial saving of water through preventing the release of compensation water right on top of freshets and through authorizing partial releases graduated to river needs during periods of transition in the river stage (R. 3529-30, 3678-79). The River Master by forecasting rises or falls in the river stage during transitional periods will not have to wait until the Port Jervis or Trenton gage rises or falls below 0.5 c.s.m. in order to stop or begin the release of compensation water, but will be able to foretell that river stage and thus provide for the gradual commencement or cessation of releases (R. 3529-30, 3678-80).

The measurement of stream flow will constitute another important function and duty of the River Master. Under the New York plan of impounding and release, the measurement of water requires the proper determination of many complicated variables which call for an independent and impartial judgment as well as a high degree of personal skill (R. 3227-28, 3671-74). The measurement of water under the Pennsylvania plan of impounding and release is simple, direct and public but no less vital (R. 3674-76).

A third important function and duty of the River Master will be to direct what use shall be made of the surplus waters which should not be permitted to

flow wastefully and without regulation over the spillways of the impounding reservoirs (R. 3228-29). These surplus waters will constitute at least 22% of the yield or runoff from the catchment area. Among other things, the River Master will have to say what becomes of surplus waters during the twenty-five years required to complete the construction of the New York project (R. 3228-29).

A fourth important function and duty of the River Master will be the determination of what constitutes such an emergency as to justify the setting aside of the terms and conditions of impounding and release in order to relieve primary human needs caused by a break-down or other interruption in the water supply system of a stricken state (R. 3229). He must not only decide that such an emergency exists but must also determine the steps to be taken in its relief (R. 3229).

Obviously, these functions and duties of a River Master involve many discretionary matters that cannot possibly be foreseen and included in a single decree by this Court. As Messrs. Ryder and Morgan testified without contradiction, these functions and duties can best be performed by a person of judicial appointment without bent of interest; and the need for a River Master is not so much a matter of integrity as it is of impartiality and skill (R. 3227-30, 3527-28, 3680, 3739-40). Consequently, it is highly important that this Court appoint a skilled administrator of independent and impartial judgment to decide the many matters of interpretation, coordination and de-

cision, that are bound to arise and cannot possibly be foreseen and included in a present ruling or decree by this Court.

The Special Master conceded the inherent equity jurisdiction of this Court to appoint a River Master (R. 4952). The leading case in point is that of **Montezuma Canal Co. v. Smithville Canal Co., 218 U. S. 371 (1910),** in which this Court reviewed the western practice of appointing River Masters and upheld the innate power of a court of equity to make such appointments in order to make their decrees more effective.

Mr. Arthur E. Morgan is personally familiar with the appointment of River Masters in our Western States and explained at length the underlying reasons therefor (R. 3209-27). This western practice is also known to the New Jersey witness, Mr. Sherman, and the New York witness, Mr. Merriman (R. 727, 2778-79). Experience in our western courts of equity reveals that the best as well as the only practical method of enforcing a decree respecting the division and use of water is by the judicial appointment of a River Master. We respectfully suggest that this Court should give heed to that experience and appoint a Delaware River Master in order that its decree may be more effectively carried out and in order that there may be an even greater conservation of water under the flexible Pennsylvania plan of impounding and release.

The Special Master urged the retention of jurisdiction by this Court in order to permit a revision of

the Pennsylvania plan of impounding and release, if found necessary after a practical test during the operation of the first development of the New York taking (R. 4956). We submit that a judicial River Master is best qualified to judge the practical operation of the Pennsylvania plan of impounding and release and to determine therefrom what modification, if any, is necessary. The retention of jurisdiction through such a River Master will eliminate any need for the appointment of a Special Master to pass upon the advisability of any such modification.

2. *The necessity for an allocation of Pennsylvania's fair and equitable share in the waters of the Delaware River and its tributaries.*

The Special Master denied without prejudice the present application of Pennsylvania that the City of Philadelphia and Eastern Pennsylvania be presently allotted 750 m.g.d. from the Pennsylvania tributaries of the upper Delaware River as their fair and equitable share in the waters of that river (R. 4946-50). He found that this proposition was not embraced within the statement of relief and was beyond the authority and jurisdiction of this Court because the Commonwealth is in substance asking for a declaratory judgment of its rights (R. 4946-50).

Both of these objections will be removed by the Intervenor waiting until a definite project to take water from the Pennsylvania tributaries of the upper Delaware River has been adopted and authorized by the proper state authorities and then filing in this

Court a proper application for such an allocation. However, the desire of Philadelphia and Eastern Pennsylvania for such an allocation justifies a retention of jurisdiction as recommended by the Special Master.

In preparing the Pennsylvania proofs in the present cause, the Attorney General and his engineers had to determine first whether the proposed New York diversion (Ex. 4) exceeded New York's fair and equitable share in the waters of the Delaware River and its tributaries. This could only be accomplished by ascertaining the present and reasonable future needs of Pensylvania and New Jersey in those waters and then determining whether the Delaware River and its tributaries could satisfy the water needs of all three States without causing material damage to any Pennsylvania interests. After a most exhaustive study of all available data, the Pennsylvania engineers concluded that the water needs of all three States could be filled without material damage under the Pennsylvania plan of impounding and release; and therefore the Commonwealth did not ask this Court to cut down the quantity of the proposed New York diversion (Ex. 4), but did request the adoption and application of their plan.

In their study of the Delaware River and what protective measures were required by the interests of the Commonwealth, the Pennsylvania engineers further determined that there was peculiar need for a present allocation of Pennsylvania's fair and equitable share, because of the competitive character of

the upper Delaware River water supply area and because Philadelphia and Eastern Pennsylvania must sooner or later abandon their present downstream source of highly polluted water for a pure upland supply that can be only obtained from the Pennsylvania tributaries of the upper Delaware River. When this pressing need was first called to the attention of the Attorney General during the course of the hearings, he immediately decided that the Commonwealth of Pennsylvania should prove as part of its case the necessity for such a present allocation and ask the Special Master to make the allotment and thus complete the apportionment of the waters of this interstate stream.

The first step in proving the necessity for such an allocation was the determination of the present and estimated, reasonable, future water needs of Philadelphia and Eastern Pennsylvania. To that end, the Intervenor called Messrs. Weston and Swaab, who first gave undisputed testimony regarding the present population and water consumption of Philadelphia and Eastern Pennsylvania (R. 3288-92, 3308-09, 3378-88). From their testimony it appeared that Philadelphia with a 1930 population of 1,961,458 consumed 350 m.g.d. of water and Eastern Pennsylvania with a 1930 population of 2,700,000 used 425 m.g.d. (R. 3288-92, 3378-88); and that Philadelphia now takes slightly more than one-half of its present water supply from the Delaware River and the remaining portion from the Schuylkill River (R. 3377-79; Ex. 404). It further appeared that when Philadelphia's

present distribution system, including the reservoirs and filters, is brim full, the City has about three days supply of water on hand at the ordinary rate of consumption, whereas other large cities have at least a sixty day supply on hand; and that if the Philadelphia pumps break down as in 1926, or consumption increases enormously as during July, 1930, a critical water situation arises (R. 3378, 3385, 3434).

Messrs. Weston and Swaab estimated the 1980 population of Philadelphia and Eastern Pennsylvania at between five and six million and the 1980 water consumption at 750 m.g.d. (R. 3292-93, 3294-98, 3379-81, 3387-88, 3425-26).

Both Mr. Weston and Mr. Swaab testified that Philadelphia and its metropolitan area will eventually have to abandon its present polluted downstream water supply from the lower Schuylkill and Delaware Rivers because of pollution, hardness and the growing popular aversion against the continued drinking of purified sewage (R. 3299-3302, 3314-15, 3343-44, 3399-3400). They explained that these two rivers now are and must in the future continue to be the main drainage agencies of a populous and highly industrialized community; that the further treatment of sewage and industrial waste under the Philadelphia comprehensive plan of 1915 will improve but never remove the necessary polluted condition of both rivers, since no sewage treatment works can produce 100% results or prevent an effluent or discharge of partially or incompletely purified waste; and that the growing popular aversion towards these polluted sources of

water supply is due to the disagreeable association inevitably caused in the minds of consumers by the drains and discharges from sewage treatment works (R. 3299-3349, 3349-53, 3400-04, 3427-30).

This aesthetic revulsion against drinking purified sewage was aptly expressed by Professor Sedgwick when he said that "innocence and not repentance was required of a public water supply" (R. 3347, 3352-53). Although polluted water can be treated so as to comply with the United States public health standards and although the filtered river water served in Philadelphia largely complies with these standards (R. 3409), yet the aesthetic sense of the consumer will never be satisfied with purified water, since he can never disabuse his mind from the unpleasant association incident to a polluted downstream supply (R. 3344, 3353). There can be no doubt of the wisdom of a policy that provides that one must start with the purest and best supply possible and then treat it rather than commence, as Philadelphia now does, with polluted water and then purify it (R. 2783, 3047-48, 4441-42). This policy exists all over the United States and is aptly illustrated by numerous examples along the Atlantic coast where there is a choice between pure Appalachian Mountain supply and lower river sources heavily polluted by sewage and industrial waste (R. 2948-49, 3302-05, 3310-19, 3322-28).

Mr. Weston stated that public opinion should be heeded in the selection of a water supply (R. 3875-76) and gave many instances in which public opinion

was responsible for the abandonment of a polluted downstream river supply (R. 3303-04, 3382-87). Barring the New Jersey witness, Mr. Pearse, who would disregard the wishes of the public (R. 2227-31), the water experts in the present case would recognize this popular aversion against drinking purified sewage (R. 2783, 3299-3300, 3339, 3349-51, 4201, 4441-42).

After enumerating the several sources considered by Philadelphia in the past as a possible source of water supply and showing why said sources were unsuitable and no longer available (R. 3388-92), both witnesses stated that the Pennsylvania tributaries of the upper Delaware River were, in their opinion, the best available source for a future water supply to Philadelphia and Eastern Pennsylvania (R. 3301-03, 3305-07, 3317-20). Since the Ashbridge Commission of 1889 made its report, these Pennsylvania tributaries have uniformly been recognized as the best source of water supply for Philadelphia and Eastern Pennsylvania but have never been so recommended solely because of the costs incident to such a supply (R. 3392-99). Both Mr. Swaab and Mr. Weston expressed the view that costs and not desire was responsible for Philadelphia not having already changed to this upland source (R. 3301, 3396-98).

The advantages to be gained by going to the Pennsylvania tributaries of the upper Delaware River for a future water supply are manifold and obvious. According to the unimpeached testimony of Messrs. Weston and Swaab they are (*a*) a water of pure

quality, with little or no danger of artificial and accidental pollution, thereby effecting a substantial reduction in Philadelphia's present filtration costs (it being understood that even a pure upland source ought to be filtered in order to assure perfect safety) and also thereby completely eliminating the growing, popular aesthetic revulsion against the continued drinking of purified sewage, (*b*) a softer and better quality of water for high grade industrial processes, (*c*) a cooler water, which is a criterion of excellence, (*d*) a gravity feed, that will largely eliminate costly pumping in perpetuity as now required under Philadelphia's present distribution system, and (*e*) ample storage capacity, to supplant the present scant three day supply with its serious menace to public health if any substantial breakdown occurs at the Philadelphia pumping stations (R. 3302-03, 3349-52, 3404-05, 3409, 3434-35, 3873-77, 3885-86).

In order to show the adequacy of the Pennsylvania tributaries of the upper Delaware River as a future source of water supply for Philadelphia and Eastern Pennsylvania, Messrs. Swaab, Ryder and Morgan produced maps showing this source of water supply and the location, capacity and yield of the several catchment areas and reservoirs required to supply the desired 750 m.g.d. (R. 3181-94, 3237-38, 3362-65, 3406-09, 3472-75, 3609-10, 3884-85, Exs. 401, 408, 409 and 412). Pennsylvania will develop 870 square miles of catchment area or 25% of the Delaware River watershed within its territorial limits; and will take

70% of the yield or run off of this catchment area (R. 3472-75, 3609-10).

In further proof of the adequacy of the upper Delaware River as a future source of water supply, Mr. Ryder produced on behalf of Pennsylvania daily flow diagrams and supporting data (Exs. 413-22) to show the condition of the Delaware River when New Jersey, Pennsylvania and New York are taking their respective aliquot shares of water and releasing compensation water under the Pennsylvania and New York plans of impounding and release (R. 3474-3514). These daily flow diagrams were prepared in response to the request of the Special Master for such a computation, and are fully discussed in a prior section of this brief (pp. 38-41, *supra*). They show not only the adequacy of the catchment areas (Ex. 412) to supply the 1750 m.g.d. required to meet the reasonable future needs of all three States, but also the non-injurious effect on stream flow, providing that total quantity is taken pursuant to the Pennsylvania plan of impounding and release.

Since there can be no doubt regarding the adequacy of the upper Delaware River as a future water supply, the Pennsylvania proofs next brought out the highly competitive character of this water supply area in the absence of proper control and regulation. Mr. Morgan emphasized the fact that the upper Delaware River watershed was a competitive water supply area, because it was from a physical standpoint somewhat equally available to New Jersey, New York and Pennsylvania and yet the total amount

of water, which can be diverted from it without damage, is ultimately limited (R. 3202). Due to the undisputed fact that a prior taking of water from this area by one State will definitely affect and possibly prevent a later taking by another State, the policy of the consumer is primarily controlled by the necessity of getting a preferred position (R. 3201-03, 3262). This competitive area roughly comprises any point above Trenton, New Jersey (R. 3202-03, 3278-79).

In contrast to this competitive area, there are so-called non-competitive regions, the water supply of which is out of the reach of other States and will therefore await the needs of the situs State (R. 3201-02). Examples of non-competitive water supply areas, that are peculiarly available to one State alone, are the East Hudson supply for New York City and the inadequate, nearby surface streams of Philadelphia (R. 3201-02).

Mr. Morgan pointed out that if this water supply area of the upper Delaware River is permitted to remain openly competitive and without judicial regulation and control, then Philadelphia and Eastern Pennsylvania will have to abandon their present economy of first developing the limited nearby surface streams and incur at once the great expense of going immediately to the Pennsylvania tributaries of the upper Delaware River in order to protect their future water supply (R. 3203-06). Because of the non-competitive character of Philadelphia's inadequate nearby sources, their development can be in-

terrupted and postponed if open competition demands it (R. 3205-06, 3277-79).

According to the witness, the conditions necessary to protect Philadelphia and Eastern Pennsylvania against wasteful competition for the waters of the Delaware River are (1) a complete understanding of the part, which these tributaries will play in the future water supply of the tri-state metropolitan area of Southern New York, Northern New Jersey and Eastern Pennsylvania with a population between ten and fifteen millions, (2) judicial control over the diversion and use of water from this area, and (3) a present allocation to each State of its fair and equitable share of water from this source (R. 3205-06, 3209, 3256-58).

Both Mr. Weston and Mr. Swaab testified that if wasteful competition be eliminated for the tributaries of the upper Delaware River, the probable and most economical development of a water supply for Philadelphia and Eastern Pennsylvania will be to go first to the Perkiomen, next to the Tohickon, then to the tributaries of the upper Lehigh, and finally to the tributaries of the upper Delaware River (R. 3305-07, 3405-07, Ex. 408). They recommend the establishment of a metropolitan water district to serve Philadelphia and Eastern Pennsylvania, so that the costs incident to this progressive development upstream may be distributed and thus equalize the financial load that has been the sole deterrent in the past (R. 3306-07).

There is but one method by which destructive com-

petition for this limited water supply from the upper Delaware River and its tributaries can be presently forestalled and eliminated; and that is judicial control over the division and use of water from this competitive area. The first step in such control is a present allocation by this Court of the pro rata shares of each State in these waters.

Mr. Swaab urged that Philadelphia should now begin to plan for its future supply of water and should at least adopt a fixed plan so that as it becomes necessary from time to time to replace any part of its present costly pumping system of waterworks, it can be revamped so as to fit into a future gravity feed from the Pennsylvania tributaries of the upper Delaware River (R. 3408-09). Mr. Morgan stated that a municipal water supply program should look forward at least 25 years, since this was but considering present needs due to the inertia and other difficulties incident to a vast public water project (R. 3201-02).

The present New York project (Ex. 4) will take at least twenty-five years to complete according to New York witnesses; and if Philadelphia and Eastern Pennsylvania are to be equally provident, they must now lay the necessary grounds for their future upstream water supply. The Pennsylvania State Sanitary Water Board has made such a program possible by classifying the Pennsylvania Tributaries of the upper Delaware River as Class "A" streams (R. 3775-79). The next step should be a judicial allocation of these tributaries for their future water needs.

Although Philadelphia and Eastern Pennsylvania do not, under their present program of economic development, presently require water from the Pennsylvania tributaries of the upper Delaware River, yet they will require 750 m.g.d. from that source by the year 1980. The fact that their need of upstream water still lies in the future will not make that need less acute when they eventually have to go to that source.

What their interests now require is the judicial assurance that when that future water necessity arises, as it must, their fair and equitable share in these upland waters will be waiting for them. But unless destructive competition for this water supply area be eliminated by a present allocation by this Court, there can be no positive and satisfactory assurance to Philadelphia and Eastern Pennsylvania that they will not in the meantime be robbed of their fair and equitable share.

Despite the present refusal of such assurance by this Court, the Commonwealth of Pennsylvania expects to renew its application for an allocation of 750 m.g.d. from the Pennsylvania tributaries of the upper Delaware River as soon as a definite project for such a taking from that area has been adopted and authorized. Otherwise, Philadelphia and Eastern Pennsylvania must immediately cast aside their present economic development of non-competitive but inadequate nearby sources and seize their share of competitive upland water, while the race is still open and the grabbing is still good.

The fact that New Jersey is not completely dependent for its future water needs on the upper Delaware River and has therefore disclaimed any present intention or desire for an award by this Court of 400 m.g.d. (which according to the uncontradicted testimony of Mr. Weston will be sufficient to meet the water needs of its citizens up to the year 1980) does not militate in any manner against the necessity for an allocation of 750 m.g.d. to Philadelphia and Eastern Pennsylvania. It is perfectly apparent that the oyster men of South Jersey are bound and determined that the populous tri-state metropolitan area of Southern New York, Northern New Jersey and Eastern Pennsylvania shall have no water from the upper Delaware River to quench their thirst; and that even the pressing water needs of metropolitan North Jersey must bow to the alleged needs of the oyster industry of South Jersey.

This will probably account for the puzzling action of counsel respecting the testimony of Mr. Hill and his Exhibit 262 (R. 2175-82). This evidence was interjected into this litigation by counsel for New Jersey near the end of his proofs without apparent rhyme or reason and was never connected up with any preceding or following testimony. Counsel for New Jersey obviously sought to accomplish two purposes by its admission, first to lure North Jersey into believing its water needs were being attended to, and second to have an anchor to windward in the event of an adverse decision on New Jersey's contention that common law riparian rights and not the doctrine

of apportionment should govern the decision of this Court.

The silence of the New Jersey proofs respecting the water needs of North Jersey's metropolitan area is rendered most significant by the admission of Professor Barrows that he had knowledge of the proposed diversion of water from the upper Delaware River by North Jersey (R. 564-66) and by the abundant evidence offered through the New York witnesses, Messrs. Fuller and Merriman, regarding the past and present studies of North Jersey in anticipation of such a taking (R. 3036-37, 3048-49, 3062-67, 3084-95; Exs. 352-55).

The foregoing Pennsylvania proofs establish beyond peradventure the many cogent reasons why Philadelphia and Eastern Pennsylvania must shortly abandon their seriously polluted downstream water supply for a pure upland source with its manifold advantages and why the Pennsylvania tributaries constitute the best as well as the sole remaining available source for such a supply. These proofs further disclose the highly competitive character of this water supply area and the necessity for an allocation by this Court of Pennsylvania's fair and equitable share in these waters in order to forestall and avoid wasteful competition.

In conclusion, we submit that this Court should retain jurisdiction of the present cause so that the Commonwealth of Pennsylvania may hereafter apply for an allotment to Philadelphia and Eastern Pennsylvania of their quota of water from the Pennsyl-

vania tributaries of the upper Delaware River and thus procure judicial assurance that these waters will be available to them, when and as required.

3. *The possible need for further proof regarding the effect of the New York taking upon salinity conditions in the lower Delaware River.*

Under the section of this brief dealing with the effect of the New York taking upon the industrial use of Delaware River water (pp. 112-117, *supra*), we called attention to the recent abnormal rise in saline content of the Delaware River in the vicinity of Chester and the grave need of a two year survey to determine all the factors regarding the marginal zone of salinity that moves upstream and downstream with the variations in stream flow. In order that this survey may not be rendered nugatory, it is essential that this Court retain jurisdiction of the present cause so as to permit the Commonwealth of Pennsylvania to submit proof of any damage disclosed thereby and to ask whatever relief may be required under the circumstances.

F. Conclusion.

We respectfully submit that for the several reasons above stated:

1. The interstate common law doctrine of equitable apportionment should govern the division and use of the interstate waters of the Delaware River and its tributaries; and that under that doctrine the present New York taking is chargeable against its fair and equitable share in said waters;

2. The principle of the Pennsylvania plan of impounding and release should be adopted and applied to the present New York taking because it is the best plan and will best conserve and improve river conditions;

3. The Pennsylvania plan of impounding and release will protect all interests against substantial damage from the New York taking; and

4. This Court should retain jurisdiction over the present cause in order to permit the future application by the Commonwealth of Pennsylvania for an appointment of a River Master and for an allocation to Philadelphia and Eastern Pennsylvania of 750 m.g.d. from the Pennsylvania tributaries of the upper Delaware River. Jurisdiction should also be retained to protect Pennsylvania interests against the possibility of adverse salinity conditions in the lower Delaware River from the present New York taking.

Respectfully submitted,

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